VOL. LXXXII MAY, 1933 N. S. VOL. 35, No. 5

JOURNAL
of the
American Veterinary Medical Association

EDITED AND PUBLISHED FOR
The American Veterinary Medical Association

MAY -4 1933

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$4.00 per annum Foreign $5.00; Canada $4.50 Single Copies 40 cts. in U. S.

Published monthly at 1230 W. Washington Blvd., Chicago, Ill. Entered as Second Class Matter, August 10, 1932, at the Post Office at Chicago, Illinois, under the Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of February 28, 1925, authorized August 10, 1932.

FARM relief measures before the Congress point to increased farm commodity values, which will obviously create renewed interest in the services of capable veterinarians, practicing under the protection of sales policies that promote the advancement of scientific veterinary medicine.

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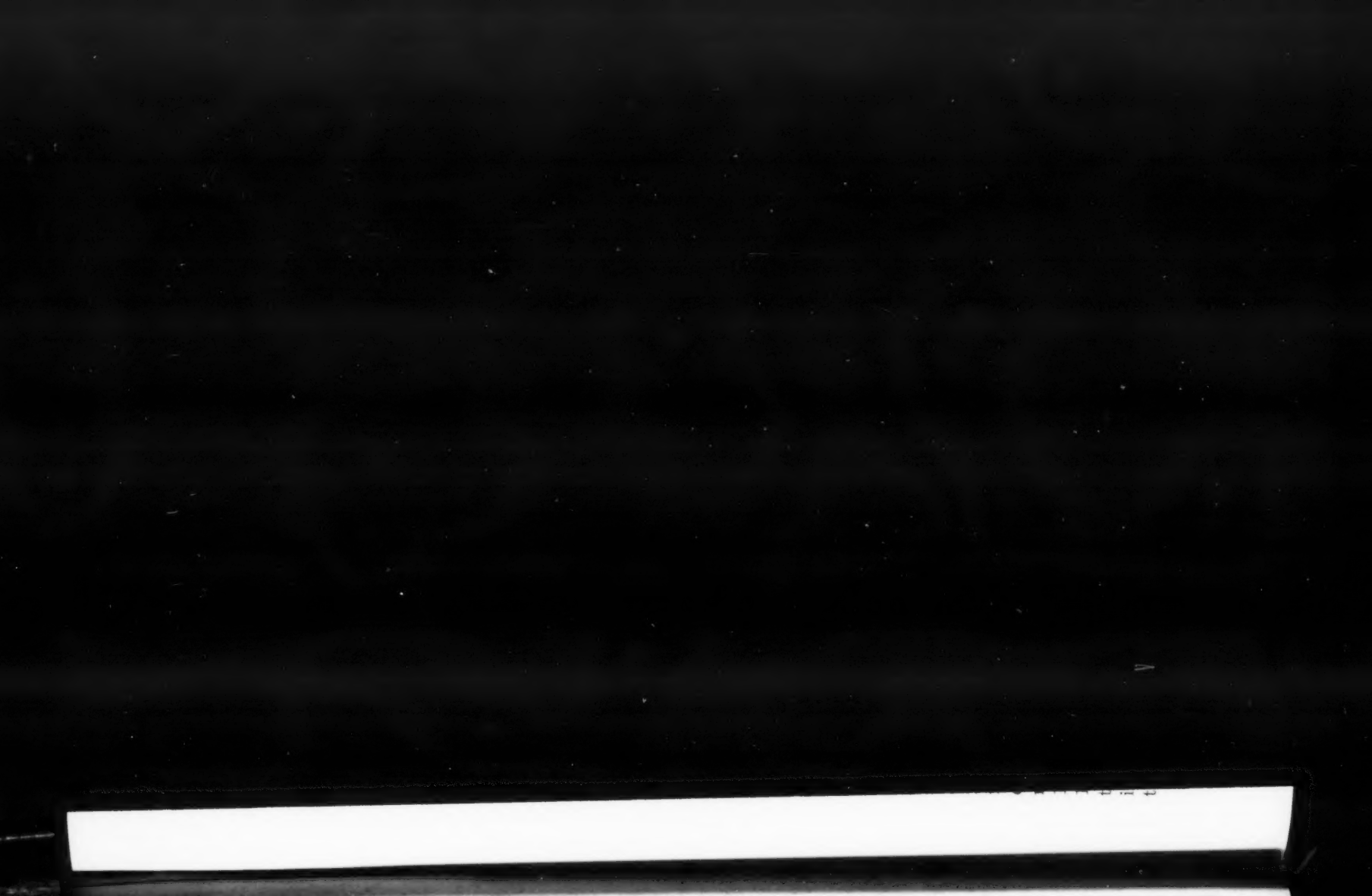

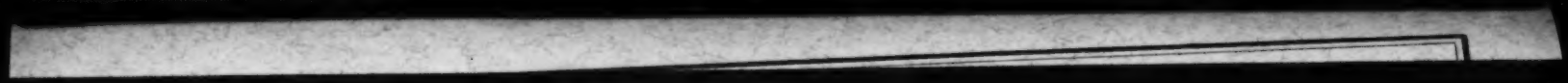

JOURNAL
of the
American Veterinary Medical Association
Formerly AMERICAN VETERINARY REVIEW
(Original Official Organ U. S. Vet. Med. Assn.)
H. Preston Hoskins, Secretary-Editor, 1230 W. Washington Blvd., Chicago, Ill.

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Vol. LXXXII, N. S. Vol. 35 MAY, 1933 No. 5

FIFTY YEARS OF USEFUL SERVICE

The year 1933 really marks a half-century of organized control of animal diseases in the United States. Just fifty years ago, the Veterinary Division of the United States Department of Agriculture was established, and Dr. Daniel Elmer Salmon called to Washington to take charge. The Veterinary Division, as such, was really the forerunner of the Bureau of Animal Industry, which was established by Act of Congress, May 29, 1884, "to prevent the exportation of diseased cattle, and to provide means for the suppression and extirpation of pleuropneumonia and other contagious diseases among domestic animals."

History records how well the task of eradicating contagious pleuropneumonia was accomplished. On September 26, 1892, Secretary of Agriculture Rusk issued a proclomation which removed all then existing quarantines against the disease. The first great task undertaken by the new organization was an accomplished fact! Although a few isolated cases of pleuropneumonia were reported in New York and New Jersey as late as 1891 and 1892, most of the infection had been eradicated by 1889, or in about five years after the job was started. Since the year 1884, foot-and-mouth disease has made its appearance in the United States on eight different occasions and each time the plague has been eradicated, largely through the coördinated

efforts of the trained veterinary personnel of the Bureau of Animal Industry and the states affected.

Tick eradication is another example of what can be accomplished through organized effort. A tick-infested area that originally covered 728,565 square miles in fifteen states has been reduced to 90,462 square miles in three states. Nine states have been made practically free of bovine tuberculosis as the result of systematic tuberculin testing, condemning and removing reactors, and disinfecting premises where tuberculous cattle have been kept.

And so we could go on relating the accomplishments of the veterinary service that stands preëminent throughout the world, the model for numerous other countries that have copied the American system, either in whole or in part. Glanders and dourine have become comparatively rare diseases. Scabies, hog cholera, Bang's disease and several other animal plagues are offering strong resistance, but they will be conquered, just as the others have been. Meanwhile other diseases will appear to demand attention. Witness anaplasmosis in cattle, encephalomyelitis in horses and erysipelas in swine and sheep. Parasitoses, in many respects, are equally as important problems.

In directing attention to the completion of fifty years of useful service in disease control and eradication, we are not unmindful of the other activities of the veterinary arm of our federal government. Prominent among these are meat inspection and research work. Both of these activities go on quietly, without any fanfare. Every citizen is a beneficiary in one way or another but very few realize this fact or appreciate the untold benefits.

Birthday greetings to our colleagues in the Bureau of Animal Industry.

FALSE ECONOMY

Colorado has taken what would appear to be a backward step, at least as far as state live stock sanitary control work is concerned. The Colorado legislature recently passed the so-called Code Bill, which will have the effect of abolishing in the neighborhood of forty-five state offices, boards, commissions and departments, including the office of State Veterinarian. The Governor has already signed the bill which will become effective July 1.

The State Board of Stock Inspection Commissioners is recreated, to consist of seven members, six of whom shall be cattle

men or sheep men and the seventh member to be a graduate veterinarian who shall take over all the duties of the State Veterinarian and be known as the Live Stock Sanitary Commissioner. He will be employed on a per diem basis, but not to exceed $1,000.00 per year, with an expense allowance of $500.00 per year.

Although tremendous pressure is being exerted from all directions in practically every state of the Union, in an effort to reduce public expenditures which in turn will have the effect of easing the tax burden, false economies are not going to be profitable in the long run. Many states have already made large investments in animal disease control. For example, the appropriations that have been made and expended for the eradication of bovine tuberculosis are investments in every sense of the word. These investments should be protected. Failure to follow up the work, particularly in those areas which are now accredited but which are more or less exposed to reinfection, will have the effect of jeopardizing what has already been accomplished. Let us hope that none of the other states will follow the example set by Colorado.

OUR OLDEST MEMBERS

The death of the oldest member of the A.V.M.A., Dr. John C. Meyer, in January, has raised the question as to who succeeds to the honor so long held by Dr. Meyer. Well, this honor is divided equally between two members, Dr. C. W. Crowley (Amer. '76), of Saint Louis, Mo., and Dr. Benjamin McInnes (R.C.V.S. '74), of Charleston, S. C. Both joined the A.V.M.A. in 1876, and have been in continuous good standing ever since. Here is a list of the ten oldest members now on the roll:

Joined	
1876	Crowley, C. W., Saint Louis, Mo.
	McInnes, Benjamin, Charleston, S. C.
1882	Howard, Lester H., Brookline, Mass.
1884	Berns, George H., Brooklyn, N. Y.
	Vogt, A. G., Allenhurst, N. J.
1885	Hollingworth, W. G., Utica, N. Y.
1886	Lowe, Wm. Herbert, Paterson, N. J.
1887	Bland, Thomas, Waterbury, Conn.
	Butler, Tait, Memphis, Tenn.
1889	Eves, H. P., Wilmington, Del.

A total of 494 years of membership, or an average of 49.4 years for the ten. Truly, a wonderful record.

CONVENTION EXHIBITS

As is the case with clinics, exhibits have come to be an important feature of A. V. M. A. conventions. It would be practically impossible to state definitely when the first commercial exhibit was held in conjunction with an A. V. M. A. meeting. Manufacturers of veterinary surgical instruments appeared on the scene soon after clinics became a recognized part of each convention. New instruments for old operations or specially designed instruments for some new operation frequently were tried out at the clinic. Our older convention-goers will recall demonstrations of some new-fangled thermo-cautery when this particular piece of apparatus was a part of the armamentarium of every practitioner.

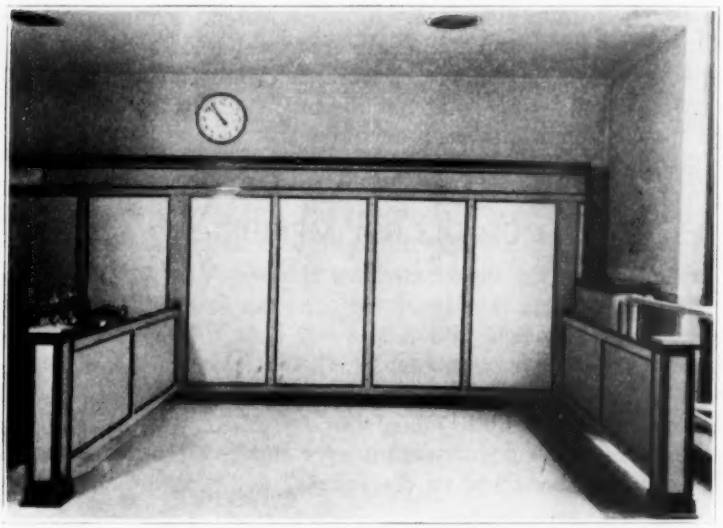


EXHIBIT BOOTH AT PALMER HOUSE

Mr. Alexander Eger, the well-known publisher of veterinary books, displayed several new books at the Chicago meeting in 1893. The so-called K. C. V. C. operating-table was shown and used at the Minneapolis meeting in 1902. The passing of Phillips' improved stomach-tube was demonstrated by Dr. George R. White at Saint Louis, in 1904. It was from these modest beginnings that the commercial exhibit of the present day has developed. From the standpoint of the exhibitor, an A. V. M. A. convention offers an opportunity for contacting a large number of

potential buyers in a short period of time. From the standpoint of the veterinarian, he frequently has an opportunity to see for the first time something that he has heard about or read about in an advertisement.

In addition to the strictly commercial side of exhibits of instruments, books, pharmaceutics, biologics, and what not, there is a certain amount of educational value, varying from little to much. Too frequently the possibilities of the educational phase have been slighted for the purely commercial side. As a result of this condition, there has been a noticeable demand for purely educational exhibits. A splendid start in this direction was made at Los Angeles, in 1930. The idea was continued, although on only a limited scale, at Kansas City, in 1931, and at Atlanta, in 1932.

This year the Local Committee on Arrangements through the Subcommittee on Exhibits is planning something really worth while in the form of purely educational exhibits. The Palmer House, official headquarters of the convention, affords unexcelled facilities for housing the exhibits, both commercial and educational, and the fullest possible advantage is going to be taken of this fact, in the interest of both exhibitor and visitor. When you visit the Exhibition Hall at the Palmer House, August 14-18, you will go away with something more than a few jimcracks as souvenirs of the convention.

EXECUTIVE BOARD ELECTIONS

It would be an unusual Executive Board election that did not develop some new situation. The election now in progress in District 2 (Pennsylvania, New Jersey and Delaware) proved to be no exception to the rule. When the ballots cast in the primary election were counted, it was found that there was an eight-man tie for fifth place, each of these nominees having received one vote. Under a strict interpretation of the By-Laws, all of the eight names should have been placed on the ballot. This would have resulted in a ballot containing twelve names. In other words, the name of every nominee would have been placed on the ballot for the election proper.

To meet the situation, a letter was written to each of the eight members who were tied for fifth place with one vote each. The circumstances were explained and each was asked if he wanted his name to appear on the ballot. Four replied very emphatically that they were not candidates and did not want their names

used. Three replied that they were willing to have their names appear on the ballot and one member did not reply at all. Accordingly there was only one thing to do and that was to make up the ballot with eight names on it, including the four who stood first, second, third and fourth, and four of those who had been tied for fifth place. It is of interest to point out that a father and son are among the nominees.

It should be explained that it always has been customary to honor the request of a member who has been nominated but who does not choose to run, by leaving his name off the ballot. It frequently happens that well-meaning friends nominate members who are not in a position to serve as members of the Executive Board.

In District 3 (Illinois, Indiana and Wisconsin) there was some confusion caused by the circulation of unofficial ballots. Unfortunately some of these got into the hands of non-members and delinquents. One member evidently forgot that he had voted his official ballot and then mailed in an unofficial ballot, which was caught in the checking process. This member was not at all partial, as he voted for a different member each time.

The nominees in the two districts follow:

DISTRICT 2

ALTHOUSE, E. P. — Sunbury, Pa.

Practitioner. Graduate of University of Pennsylvania, 1903. Joined A. V. M. A., 1903. Member of Committee on Program, 1928-29; secretary of Section on General Practice, 1926-29; member of Executive Board (District 2), 1928-.

CUSHING, E. R. — Plainfield, N. J.

Practitioner. Graduate of New York State Veterinary College at Cornell University, 1920. Joined A. V. M. A., 1923.

MCNEIL, J. H. — Trenton, N. J.

Chief, New Jersey Bureau of Animal Industry. Graduate of University of Pennsylvania, 1898. Joined A. V. M. A., 1899. Member of Committee on Army Legislation, 1904-07; member of Committee on Intelligence and Education, 1907-09; member of Committee on Legislation, 1920-25; resident secretary for Brazil, 1912-15; resident secretary for New Jersey, 1926-27; secretary of Section on Sanitary Science and Police, 1923-25; third vice-president, 1907-08; second vice-president, 1909-10; fifth vice-president, 1922-23; fourth vice-president, 1924-25.

MARSHALL, C. J. — Philadelphia, Pa.

Professor of Veterinary Medicine, University of Pennsylvania. Graduate of University of Pennsylvania, 1894. Joined A. V. M. A., 1895. Member (1902-03, 1910-13) and chairman (1906-10) of Committee on Publications; member (1903-04) and chairman (1915-16) of Executive Committee; chairman of Committee on Intelligence

and Education, 1904-06; member of Committee on Legislation, 1923-28; member of Committee on History, 1928-; resident secretary for Pennsylvania, 1901-05; secretary, 1910-13; fourth vice-president, 1903-04; first vice-president, 1908-09; president, 1913-15.

MILLAR, HARRY C. Asbury Park, N. J.

Practitioner. Graduate of University of Pennsylvania, 1890. Joined A. V. M. A., 1924.

MILLAR, JOSEPH A. S. Asbury Park, N. J.

Practitioner. Graduate of University of Pennsylvania, 1928. Joined A. V. M. A., 1928.

MOON, JOSEPH G. Philadelphia, Pa.

State sanitary control work. Graduate of University of Pennsylvania, 1916. Joined A. V. M. A., 1918.

SMITH, T. E. Jersey City, N. J.

Practitioner. Graduate of New York College of Veterinary Surgeons, 1897. Joined A. V. M. A., 1898. Chairman of Committee on Finance, 1903-05; member of Committee on Publications, 1905-06, 1907-08; member of Special Committee on Fiftieth Anniversary, 1912-13; resident secretary for New Jersey, 1901-03, 1916-19; fourth vice-president, 1918-19.

DISTRICT 3

AXBY, J. L. Lawrenceburg, Ind.

Practitioner. Graduate of Chicago Veterinary College, 1903. Joined A. V. M. A., 1908. Member of Committee on Legislation, 1926-31.

FERGUSON, T. H. Lake Geneva, Wis.

Practitioner. Graduate of Ontario Veterinary College, 1896. Joined A. V. M. A., 1912. Member of Committee on Abortion, 1921-22; member (1922-26) and chairman (1926-27) of Committee on Intelligence and Education; member (1929-30) and chairman 1928-29) of Committee on Policy; chairman of Committee on Budget, 1929-30; member of Committee on Tuberculosis, 1930-32; resident secretary for Wisconsin, 1921-22; chairman of Section on General Practice, 1916-17, 1920-21; second vice-president, 1922-23; president, 1929-30; member (ex officio) of Executive Board, 1929-31.

HEALY, J. S. Madison, Wis.

Inspector-in-charge, Tuberculosis Eradication, U. S. Bureau of Animal Industry. Graduate of McKillip Veterinary College, 1910. Joined A. V. M. A., 1917. Member of Commitee on Tuberculosis, 1929-30; resident secretary for Wisconsin, 1926-29; fifth vice-president, 1931-32.

JULIEN, R. C. Indianapolis, Ind.

Consulting veterinarian, Allied Laboratories. Graduate of McKillip Veterinary College, 1907. Joined A. V. M. A., 1912. Member of Committee on Resolutions, 1923-24; member of Committee on the Prevention of Transmissible Diseases of Animals, 1924-25; member of Committee on Necrology, 1926-27; resident secretary for Indiana, 1923-26.

MERILLAT, L. A. Chicago, Ill.

Manager, Chicago Branch, Haver-Glover Laboratories. Graduate of Ontario Veterinary College, 1888. Joined A. V. M. A., 1893. Member of Committee on Resolutions, 1898-1900, 1923-24; member (1899-1900, 1901-02, 1903-04) and chairman (1902-03) of Committee on Pharmacopoeia; member of Committee on Diseases, 1906-07; member of Executive Committee, 1906-07, 1911-12; member of Committee on Intelligence and Education, 1910-11; member of Budget Committee, 1916-18, 1924-25; member of Committee on Revision of Constitution and By-laws, 1922-23; member of Committee on Policy, 1922-23, 1924-25; resident secretary for Illinois, 1905-13, 1915-16; secretary (1919-20) and chairman (1915-16) of Section on General Practice; secretary, 1916-17; second vice-president, 1906-07; president, 1924-25; member of Executive Board (District 3), 1928-.

FIRST COLLEGE CASUALTY

A sweeping reorganization of the entire educational system in Georgia includes the discontinuance of the course in veterinary medicine at the Georgia State College of Agriculture and the Mechanic Arts at Athens. This action was taken by the Board of Regents of the University System, on April 15. The College of Medicine, at Augusta, will be closed in June, and the College of Agriculture will be merged with the University of Georgia as a school in the institution.

The course leading to a degree in veterinary medicine was established at Athens about fifteen years ago and the Georgia institution has been an approved college since 1921. The first graduates, two in number, finished their course in 1922 and the total number of graduates to date is 49, or about four per year since the institution has been in existence. There were 43 veterinary students enrolled last fall, of whom eleven are due to be graduated next month. There are six veterinarians on the faculty, according to the latest announcement of the College.

APPOINTMENTS

Dr. Carl J. Norden, of Lincoln, Nebr., has been appointed secretary of the Section on Military Medicine succeeding Dr. H. L. Darby, of Fort Worth, Texas, who found it impossible to serve. Dr. Norden automatically becomes a member of the Committee on Program by reason of the change.

Dr. C. H. Case, of Akron, Ohio, has been appointed a member of the Special Committee on Bang's Disease to fill the vacancy created by the death of Dr. W. A. Axby, of Harrison, Ohio.

Dr. W. G. Hollingworth, of Utica, N. Y., has been appointed chairman of the Special Committee on Meat Hygiene and has

accepted. This Committee, formerly known as the Special Committee on Commercial Slaughter-Houses, was authorized by a resolution adopted by the Association at Kansas City in 1931, but until Dr. Hollingworth accepted the chairmanship it had been found impossible to get anybody to serve in that capacity.

MEAT HYGIENE

In the March issue of the JOURNAL, as a part of the proceedings of the 1932 meeting of the United States Live Stock Sanitary Association, appeared a very comprehensive report on meat and milk inspection, prepared by Dr. C. A. Cary. Information for some states was incomplete, in spite of the efforts of Dr. Cary, who spent two years compiling the report.

Dr. W. G. Hollingworth, chairman of the A. V. M. A. Special Committee on Meat Hygiene, is very anxious to secure further data concerning meat inspection in states, cities, towns and villages throughout the United States, wherever there is anything of the kind. Dr. Hollingworth's committee is making a survey of meat inspection in this country and asks the assistance of veterinarians in this gigantic task. Address your communications to Dr. Hollingworth in care of the Department of Health, Utica, N. Y.

APPLICATIONS FOR MEMBERSHIP

(See January, 1933, JOURNAL)

FIRST LISTING

DAVENPORT, ROY F. Duncannon, Pa.
V. M. D., University of Pennsylvania, 1932
Vouchers: M. A. Emmerson and C. J. Marshall.

LARSEN, OSBORNE G. Newton, Utah
D. V. M., Colorado Agricultural College, 1930
Vouchers: N. C. Spalding and D. E. Madsen.

SMEAD, HAROLD L. 274 Leyden Road, Greenfield, Mass.
D. V. M., Cornell University, 1932
Vouchers: Joseph W. Vansant and John B. Lentz.

Applications Pending

SECOND LISTING

(See April, 1933, JOURNAL)

Baker, John M., Saint Walburg, Saskatchewan.
Crabb, Lewis C., 1700 Evans Ave., Fort Worth, Texas.
Hodgson, Melvin E., R. 1, Box 149, Hutchinson, Kan.
Levy, Milton C., Apt. 2, 1173 Hayes St., San Francisco, Calif.
Stiles, Sidney W., Falmouth Foreside, Me.
Willers, Ernest H., Puunene Club, Puunene, Maui, Hawaii.

The amount which should accompany an application filed this month is $8.33, which covers membership fee and dues to January 1, 1934, including subscription to the JOURNAL.

COMING VETERINARY MEETINGS

Connecticut Veterinary Medical Association. Hotel Arrigoni, Middletown, Conn. May 3, 1933. Dr. Edwin Laitinen, Secretary, 993 N. Main St., West Hartford, Conn.

New York City, Veterinary Medical Association of. Academy of Medicine, 5th Ave. and 103rd St., New York, N. Y. May 3, 1933. Dr. John E. Crawford, Secretary, 708 Beach 19th St., Far Rockaway, Long Island, N. Y.

San Diego-Imperial Veterinary Medical Association. San Diego, Calif. May 3, 1933. Dr. A. P. Immenschuh, Secretary, Santee, Calif.

Interstate Veterinary Medical Association. Elks Bldg., Omaha, Neb. May 8, 1933. Dr. G. L. Taylor, Secretary, Plattsmouth, Neb.

Chicago Veterinary Medical Society. Hotel LaSalle, Chicago, Ill. May 9, 1933. Dr. O. Norling-Christensen, Secretary, 1904 W. North Ave., Chicago, Ill.

Hudson Valley Veterinary Medical Society. Catskill, N. Y. May 10, 1933. Dr. J. G. Wills, Secretary, Box 751, Albany, N. Y.

Southeastern Michigan Veterinary Medical Association. Detroit, Mich. May 10, 1933. Dr. A. S. Schlingman, Secretary, Parke Davis & Co., Detroit, Mich.

Michigan-Ohio Veterinary Medical Association. Adrian, Mich. May 11, 1933. Dr. E. C. W. Schubel, Secretary, Blissfield, Mich.

Tulsa County Veterinary Association. Tulsa, Okla. May 11, 1933. Dr. J. M. Higgins, Secretary, 3305 E. 11th St., Tulsa, Okla.

Sixth Annual Conference of Laboratory Workers in Pullorum Disease Control. Dover, Del. May 15-17, 1933. Dr. C. L. Martin, Chairman, University of New Hampshire, Durham, N. H.

Kansas City Veterinary Association. Baltimore Hotel, Kansas City, Mo. May 16, 1933. Dr. J. D. Ray, Secretary, 1103 E. 47th St., Kansas City, Mo.

Southern California Veterinary Medical Association. Chamber of Commerce Bldg., Los Angeles, Calif. May 17, 1933. Dr. T. G. Beard, Secretary, 3684 Beverly Blvd., Los Angeles, Calif.

Keystone Veterinary Medical Association. Philadelphia, Pa. May 24, 1933. Dr. C. S. Rockwell, Secretary, 5225 Spruce St., Philadelphia, Pa.

Colorado Veterinary Medical Association. Albany Hotel, Denver, Colo. May 25-26, 1933. Dr. Floyd Cross, Secretary, Fort Collins, Colo.

American Association of Medical Milk Commissions. Hotel Plankinton, Milwaukee, Wis. June 11-13, 1933. Dr. Harris Moak, Secretary, 360 Park Place, Brooklyn, N. Y.

Eastern Iowa Veterinary Association, Inc. Mechanicsville, Iowa. June 15, 1933. Dr. Iva Dunn, Secretary, Atkins, Iowa.

American Association for the Advancement of Science. Chicago, Ill. June 19-30, 1933. Dr. Henry B. Ward, Secretary, Smithsonian Institution Bldg., Washington, D. C.

Eastern Iowa Veterinary Association. Mechanicsville, Iowa. June 15, 1933. Dr. Iva Dunn, Secretary, Atkins, Iowa.

California State Veterinary Medical Association. San Diego, Calif. June 19-21, 1933. Dr. Geo. M. Simmons, Secretary, 1386 Golden Gate Ave., San Francisco, Calif.

Oklahoma Veterinary Medical Association. Fort Reno, Okla. June 19-20, 1933. Dr. C. H. Fauks, Secretary, 1719 S. W. 15th St., Oklahoma City, Okla.

Texas, State Veterinary Medical Association of. Fort Worth, Tex. June 19-21, 1933. Dr. D. Pearce, Secretary, Box 335, Leonard, Tex.

Michigan State Veterinary Medical Association. Lansing, Mich. June 27-28, 1933. Dr. E. K. Sales, Secretary, 535 Forest St., East Lansing, Mich.

North Carolina State Veterinary Medical Association. Hendersonville, N. C. June 28-29, 1933. Dr. J. Howard Brown, Secretary, Tarboro, N. C.

New York State Veterinary Medical Society. Albany, N. Y. June 29-30, 1933. Dr. J. G. Wills, Secretary, Box 751, Albany, N. Y.

American Veterinary Medical Association. Palmer House, Chicago, Ill. August 14-18, 1933. Dr. H. Preston Hoskins, Secretary, 1230 W. Washington Blvd., Chicago, Ill.

STATE BOARD EXAMINATION

Nebraska Bureau of Examining Boards. State House, Lincoln, Neb. June 26-27, 1933. Application must be on file at Bureau 15 days prior to examination. Mrs. Clark Perkins, Director, Bureau of Examining Boards, State House, Lincoln, Neb.

RELATION OF THE ALCOHOL-MILK TEST TO PREGNANCY IN CATTLE*

By C. C. PALMER, *Newark, Delaware*
Department of Animal Industry, University of Delaware

The alcohol test of milk has been employed as a quality test, especially in Europe, for a number of years, where, according to Farrington and Woll,[1] the test is often applied to every can of milk received by European creameries and city milk depots. In this country the test has not attained a high degree of popularity and is used very little, except for determining the quality of milk for condenseries. The test is usually made by mixing equal volumes of milk with 68 to 75 per cent alcohol and observing whether coagulation results.

Ayers and Johnson[2] state the test was reported first in 1890, by Martinn in Germany, and that Hoft, in 1898, used it to give an idea of the acidity of milk. He found the higher the acidity the greater the amount of coagulation by alcohol.

Other investigators soon found the test was dependent upon other factors as well as upon acidity. Ernst[3] believes that "a positive reaction with fresh samples from individual cows or with samples from separate quarters indicates either a physiological or severe pathological inflammatory condition of the milk glands." Sommer and Binney[4] state that Ruhm, Rullman and Trommsdorf, and Campbell "claimed that a positive test was due to infected or diseased udders." Metzger[5] found that "infection of the uterus and animals lean from disease caused a positive test." Auzinger[6] stated that "milk from cows with infected vaginas and cows that had aborted were positive to the test." Henkel, Metzger and Auzinger[7] found that colostrum milk gives a positive test. As a result of these studies the test came into general use in Europe, where it was believed the test was not only of value in detecting acidity, but for other undesirable characteristics as well.

One of the recent attributes of the test is its ability to differentiate between pregnant and non-pregnant cows when applied to properly selected samples of milk. This claim for the test is made by Linkies,[8] a practicing veterinarian in Germany, who, in 1930, reported that milk from healthy udders from normal cows, mixed with equal quantities of absolute alcohol, affords a simple and sure means for the diagnosis of pregnancy. He did

*Presented at the sixty-ninth annual meeting of the American Veterinary Medical Association, Atlanta, Ga., August 23-26, 1932.

not get any false results in 18 cases of which 12 were pregnant, as became evident later. He states that by this means pregnancy may be detected as early as the 21st day. Linkies refers to the work of Ernst and states that a positive test may be obtained from milk that is badly spoiled, milk from fresh cows (colostrum), cows in heat, excited animals, pregnant cows, or cows with pathological inflammations. He concludes that in the hands of the veterinarian who alone can separate clinically cows with physiological or pathological inflammations, and thus eliminate the milk of such animals for testing, the test is very well fitted for the detection of pregnancy.

Linkies' method of conducting the test consisted of mixing equal quantities of freshly drawn milk and absolute alcohol and, after shaking the mixture, allowing it to stand for 15 minutes to three hours, when it is examined for evidence of coagulation. In case of doubt, the mixture may stand for 12 hours longer, when another reading is made. Fresh milk from normal cows that are not pregnant shows no curdling after the alcohol test, whereas, milk of pregnant cows shows curdling (positive reaction). The coagula cling to the side of the test-tube. During the last month of pregnancy, the curds assume a cheesy consistency.

The test, especially from a quality standpoint, has received careful study by investigators in this country. Ayers and Johnson,[2] in 1915, concluded from their studies of the test that it is not a reliable index of the sanitary quality of the milk and that there is no definite relation between the alcohol test and the number of bacteria in milk. Dahlberg and Garner,[9] in 1921, concluded from their studies of the test that "as ordinarily used it will reject a portion of the unsatisfactory milks, but as a whole it is unreliable and inadequate." They believe, however, that the test shows good possibilities as a practical and reliable test for determining the quality of milk for condenseries making evaporated milk.

There is evidence that the causes listed in the literature, such as acidity, colostrum, diseased udders, diseased cows, pregnancy, estrum, etc., are only remote causes which are operative only in so far as they affect the chemical composition and properties of milk. Auzinger[10] was perhaps the first to show that normal fresh milk not infrequently coagulates when treated with alcohol and that the coagulation is due to changes in the milk salts, particularly in the calcium. It remained, however, for Sommer and Binney,[4] in 1923, definitely to establish the direct

causes for the alcoholic coagulation of milk. They found the effect of milk salts is of such importance that it can easily account for lack of correlation between the alcohol test, acidity and bacteria counts. A slight increase in the magnesium or calcium content will cause a positive alcohol test, and an increase of potassium, sodium, chlorid, citrate and phosphate will not cause a positive test. The effect of the calcium and magnesium on the alcohol test is counteracted by the citrates and phosphates in the milk. A positive test with fresh milk depends mainly upon the relative amounts of these four salts present in it. They found that a high calcium content in a ration fed to cows can cause coagulation of milk in the alcohol test. They confirmed the work of Sommer and Hart[11] that heat coagulation of milk is produced by an excess of calcium and magnesium over citrates and phosphates. Since the reaction in the alcohol test is produced by the same causes, these workers believe the test will be useful in detecting the milk which causes the troublesome heat coagulation in the sterilization of evaporated milk.

It is possible that during pregnancy there may be an excess of calcium and magnesium salts over the citrates and phosphates in the milk and that when the animal is not pregnant the reverse may hold true. In such an event the alcohol test would be well fitted for the detection of pregnancy. As Linkies' results in a few cases appear to substantiate such a theory, it was decided to apply the test to the milk of a larger group of pregnant and non-pregnant cows.

The Experiment Animals

The animals used in the experiment were selected from seven herds of pure-bred dairy cattle of the Guernsey, Holstein-Friesian and Jersey breeds. In all of the herds very careful and accurate breeding records are maintained. Calving dates, estrum dates and service dates are recorded and all cows were examined for pregnancy at from 60 to 90 days following service. The herd sires were kept confined and thus all service dates were established accurately. The genital organs of the cows were not examined at the time of collecting the milk samples, the herd records serving as the guide for placing the animals in the pregnant or non-pregnant group. The cows used in the study were selected carefully with regard to breeding status, general health and condition of the udders.

The milk samples were collected in sterile test-tubes, usually from one quarter, but sometimes from two or more quarters of

the udders, labeled to identify the animals and taken to the laboratory immediately for testing. Before the 1 cc for testing was removed, the sample of milk was mixed by inverting the tube several times. One cc of milk was removed from the tube by means of a sterile 1-cc pipette and placed in a clean test-tube. To this an equal quantity of alcohol was added. The milk-alcohol mixture was agitated and readings were made at various intervals. After the 1 cc for testing was removed, the samples were stored in the ice-box and in some instances the samples were retested upon succeeding days. Data were collected upon the results obtained with alcohol of varying strength.

Results of the Experiment

The first work upon the problem consisted of a preliminary study of 38 milk samples obtained from cows known to be non-pregnant. The cows supplying these samples belonged to several herds, and although the exact calving date for each animal was not recorded, care was exercised to obtain samples from cows which were known to have calved at least 30 days prior to the collection of the samples. When tested with absolute alcohol, 26 (68.4 per cent) of the 38 samples gave positive reactions and 12 (31.6 per cent) gave negative reactions. These samples are listed in table I and numbered 106 to 143 inclusive. The positive samples showed considerable variation in the degree of coagulation. Those showing complete or nearly complete coagulation were recorded with three plus signs (+++); those showing moderate coagulation with large coagula received two plus signs (++); and those showing coagulation with very fine coagula received one plus sign (+). Some of the samples of this lot gave reactions which, according to Linkies, would indicate the last month of pregnancy, yet, according to the herd history and records, which it is believed were accurate, none of the animals were pregnant. This preliminary study cast considerable doubt upon the value and reliability of the alcohol test as an aid in the diagnosis of pregnancy in the cow and although it included more animals than the entire experiment of Linkies (18 animals), it was decided to confirm this observation by collecting additional data upon groups of known pregnant and non-pregnant cows.

Milk samples were collected and tested with alcohol from 105 additional non-pregnant cows, making a total of 143 for the entire non-pregnant group. The results of this study are shown in table I. This entire group gave 82 (57.3 per cent) positive

TABLE I—*Non-pregnant cows.*

SAMPLE	DAYS SINCE CALVING	RESULTS	SAMPLE	DAYS SINCE CALVING	RESULTS	SAMPLE	DAYS SINCE CALVING	RESULTS
1	3	+++	49	71	−	97	204	−
2	3	+	50	71	++	98	205	−
3	5	+++	51	72	++	99	206	−
4	5	++	52	72	++	100	222	++
5	8	+	53	75	+++	101	253	+
6	10	−	54	78	−	102	262	+
7	15	+++	55	79	−	103	271	++
8	15	+	56	80	−	104	288	−
9	15	+++	57	80	−	105	360	+++
10	16	++	58	80	++	106	−	−
11	19	−	59	82	−	107	−	−
12	21	−	60	83	+++	108	−	++
13	22	+	61	84	±	109	−	++
14	23	+++	62	85	−	110	−	−
15	25	±	63	90	++	111	−	++
16	29	++	64	93	+	112	−	++
17	31	±	65	94	−	113	−	−
18	31	±	66	94	+	114	−	+
19	32	−	67	102	−	115	−	+++
20	32	±	68	102	−	116	−	+
21	34	−	69	105	++	117	−	+
22	34	+	70	111	−	118	−	−
23	36	−	71	116	++	119	−	−
24	36	−	72	118	++	120	−	++
25	38	±	73	118	+	121	−	++
26	41	−	74	120	−	122	−	+
27	41	−	75	122	+	123	−	+++
28	42	+	76	128	+++	124	−	+++
29	42	+	77	130	+	125	−	−
30	43	+++	78	131	++	126	−	++
31	46	±	79	134	±	127	−	++
32	47	+	80	143	−	128	−	−
33	47	+	81	144	+++	129	−	++
34	47	−	82	144	+	130	−	++
35	48	++	83	144	+++	131	−	−
36	50	+++	84	150	−	132	−	+
37	51	+	85	160	−	133	−	+++
38	51	+++	86	160	−	134	−	+
39	53	−	87	169	−	135	−	+
40	56	−	88	169	+	136	−	−
41	57	±	89	177	−	137	−	−
42	58	+	90	178	+	138	−	++
43	58	−	91	179	−	139	−	++
44	61	±	92	180	−	140	−	+
45	63	+++	93	180	++	141	−	+++
46	65	+	94	186	±	142	−	+++
47	69	−	95	193	+++	143	−	−
48	70	++	96	196	++			

reactions, varying from one plus to three plus, 50 (34.9 per cent) gave negative reactions, and 11 (7.7 per cent) gave suspicious reactions. In recording the data for the 105 additional non-pregnant cows, the number of days between calving and collecting the sample were recorded for each animal. In table I these samples have been arranged in chronological order with reference to the number of days since calving. It will be observed that cows recently fresh give a positive reaction. This confirms the observations of other investigators. It may be observed also from a study of table I that, exclusive of the recently fresh cows, 20 of the non-pregnant cows gave reactions which, if interpreted after the method of Linkies, would indicate the last month of pregnancy.

Milk samples were collected and tested with alcohol from 77 animals known to be pregnant, as indicated by the history and herd records and confirmed by rectal examination prior or subsequent (in recently bred animals) to taking the milk samples. The results of this study are shown in table II, where the samples are arranged in chronological order with reference to the number of days pregnant. Fifty-four (70.1 per cent) of the pregnant cows gave positive reactions; 19 (24.6 per cent) gave negative reactions; and 4 (5.2 per cent) gave suspicious reactions. A study of the positive reactions in this group shows there is no correlation between the intensity of the reaction and the stage of gestation. A number of cows in early pregnancy gave three-plus reactions and cows in advanced pregnancy were negative and one plus or two plus as well as three plus.

A comparison of tables I and II reveals a higher percentage of reactors among the pregnant group of cows than in the non-pregnant animals, but the results as a whole show too great an error for the test to possess any diagnostic value.

It was found that some herds gave a higher percentage of positive reactions in both pregnant and non-pregnant animals than others. This is to be expected when the fundamental causes of positive reactions are understood, namely, an excess of calcium or magnesium salts in the milk, as shown by Sommer and Binney,[11] who found that a high calcium content in a ration fed to cows can cause coagulation of milk in the alcohol test. Herd B affords a good example of this fact. A summary of the results of the test in this herd compared with a summary for all herds is shown in table III. For all herds (220 animals) 61.8 per cent of the animals gave positive reactions, compared with 86.8 per cent positive reactions for herd B; and 31.3 per cent negative

TABLE II—*Pregnant cows.*

SAMPLE	DAYS PREGNANT	RESULTS	SAMPLE	DAYS PREGNANT	RESULTS
1	17	+	40	148	++
2	30	++	41	149	+++
3	40	−	42	149	++
4	43	+++	43	150	++
5	55	+++	44	152	+
6	60	±	45	159	+++
7	60	±	46	160	−
8	60	++	47	163	−
9	62	−	48	163	−
10	62	++	49	165	++
11	63	++	50	166	−
12	74	−	51	166	+++
13	78	−	52	170	−
14	80	++	53	172	+
15	88	+++	54	172	+++
16	88	++	55	175	+
17	89	−	56	177	+++
18	90	+	57	178	++
19	94	+++	58	180	±
20	98	+	59	180	++
21	98	+++	60	182	+++
22	103	+	61	183	++
23	105	±	62	184	−
24	105	+++	63	185	+++
25	109	−	64	187	−
26	110	+++	65	189	−
27	116	+	66	192	+++
28	117	+++	67	193	++
29	118	+++	68	204	+++
30	118	−	69	210	++
31	119	−	70	212	+++
32	120	−	71	211	+
33	120	+	72	216	+++
34	122	++	73	240	++
35	123	+	74	245	+++
36	123	+++	75	248	−
37	130	+	76	250	++
38	137	+++	77	250	++
39	140	−			

reactions for all herds, compared with 10.5 per cent negative reactions for herd B. Although the samples obtained from herd B were obtained from a relatively higher percentage of pregnant animals (44.7 per cent) than the samples for all herds (35 per cent) and since it has been shown that more pregnant animals react positive than non-pregnant animals, this increase is not sufficient to explain the greater percentage of positive reactions found in herd B. Tricalcium phosphate had been added to the

TABLE III—*Reactors in seven groups, comprising 220 cows, compared with herd B. at monthly intervals.*

	Total Animals	Positive		Negative		Suspicious		Pregnant		Non-Pregnant	
		No.	%	No.	%	No.	%	No.	%	No.	%
All groups (seven)	220	136	61.8	69	31.3	15	6.8	77	35	143	65
Herd B	38	33	86.8	4	10.5	1	2.6	17	44.7	21	55.2

Note: The table shows that the relative number of reactors is higher in some herds than in others. Herd B was such a herd, as 86.8 per cent of all animals in this herd were positive, compared with 61.8 per cent for all groups. Although a higher percentage of the samples from this herd was from pregnant animals than for all groups, this difference is not great enough to account for the greater percentage of positive samples.

grain ration of herd B as a mineral supplement and it is probable that this factor explains the higher percentage of reactions obtaining in this herd.

In reading the reactions following the mixing of the alcohol with equal quantities of milk, it was observed that the degree of coagulation may be determined best by rotating the tube, permitting the mixture to flow along the wall of the test-tube and noting the presence or absence of coagula. Samples which were negative or those giving a three-plus reaction were read very easily. In the three-plus reaction the milk-alcohol mixture is changed from a liquid to a semi-solid state and the coagula are large. Negative reactions are easily determined, there are no coagula, and the mixture possesses the appearance of normal watered milk. The one-plus and two-plus reactions are not so easily distinguished, but by rotating and tilting the test-tube the presence and size of the coagula may be determined.

The length of time the milk-alcohol mixture is permitted to stand before the results are recorded has some influence upon the test. Some samples show no change as the time interval increases, whereas, in others the reaction (coagulation) increases with time. Some samples recorded as one plus at 15 to 60 minutes would show two plus after several hours. Considerable data were collected upon this point and it was concluded that all samples should be read after standing one hour and again at 12 or 24 hours, and that in the case of differences the 12- or 24-hour reading should be given preference. The details of these data will not be presented, as the test for purposes of pregnancy diagnosis is not considered of sufficient importance.

Studies were made also upon the value of alcohols of different strengths. In this study tests were run upon the same milk, employing alcohol of 65, 75 and 95 per cent, and absolute alcohol. More positive reactions occurred with the absolute alcohol than with the 65 or the 75 per cent solution. Some samples giving a negative reaction with 65 or 75 per cent alcohol would be one or two plus with absolute alcohol. Some samples that were one plus with 65 or 75 per cent alcohol would be two plus with absolute alcohol, and some samples which were two plus with 65 or 75 per cent alcohol would be three plus with absolute alcohol. It was observed that absolute alcohol gave fewer suspicious reactions than 65 or 75 per cent alcohol. Ordinary commercial alcohol (95 per cent) gave results nearly equal to absolute alcohol. As the test is not of sufficient value for the diagnosis of pregnancy these data will not be presented.

Studies were made also upon the relation of the age of the sample to the alcohol test. In fresh samples kept at ice-box temperature the character of the reaction does not change for several days. As the lactic acid content of the milk increases, the coagulation with alcohol increases. This observation confirms previous work, but as factors other than lactic acid influence the test it is of little value as a quality test.

The milk of 20 cows was tested at month intervals in order to determine if the alcohol-milk reaction varied in individuals from time to time. The results of this study are shown in table IV. A study of these data reveals that in some cows the reaction of the milk with alcohol does not change from month to month, even though the breeding status may change, whereas, other individuals may show considerable variation in the nature of their milk reaction with alcohol from month to month and again irrespective of whether the individual is pregnant or non-pregnant. From the standpoint of the accuracy of the test, as a means for the diagnosis of pregnancy, this particular lot of cows reveals that the accuracy of the test varies from 45 to 62 per cent. This means, obviously, the test has no diagnostic value for pregnancy, as the normal probability would be 50 per cent.

Summary and Conclusions

The alcohol test of milk is not a new test. It has been employed since 1890 as a quality test for milk, but as such it has been shown to be unreliable and has been replaced by other methods. Its only value as a quality test is its usefulness in detecting milk which causes the troublesome heat coagulation in the sterilization of evaporated milk.

While there may be many factors contributing to the cause of the test, such as acidity, colostrum, diseased udders, diseased cows, pregnancy, etc., these are regarded by Sommer and Binney as only remote causes that are operative only in so far as they affect the chemical composition and properties of milk. Their work shows that "a slight increase in the magnesium or calcium content will cause a positive alcohol test, an increase of potassium, sodium, chlorid, citrate, and phosphate will not cause a positive alcohol test." Also that "a high calcium content in a ration fed to cows can cause coagulation of milk in the alcohol test."

Linkies, in 1930, reported upon a study of 18 animals and concluded that when samples of milk are selected properly, the

TABLE IV—*Comparison of the alcohol-milk reactions in individual cows at monthly intervals.*

Cow	March 8, 1932		April 4, 1932		May 23, 1932		June 25, 1932		July 22, 1932	
	Status of Animal	Alcohol Milk Test	Status of Animal	Alcohol Milk Test	Status of Animal	Alcohol Milk Test	Status of Animal	Alcohol Milk Test	Status of Animal	Alcohol Milk Test
68	Calved 18-18-31 Bred 2-24-32 Preg. 12 days	−	Preg. 38 days	−	Preg. 87 days	−	Preg. 119 days	+	Preg. 146 days	++
70	Calved 11- 5-31 Not pregnant	++	Preg. 4 days Bred March 31	++	Preg. 53 days	++	Preg. 85 days	++	Preg. 172 days	++
72			Calved 3-11-32 Open 23 days	+++	Open; not bred	++	Open; not bred	++	Open	++
78	Calved 6-15-31 Not pregnant	+	Not pregnant	−	Not pregnant	−	Bred June 20	++	Open	+
79	Calved 8- 9-31 Not pregnant	−	Not pregnant	−	Not pregnant	−	Not pregnant	−	Not pregnant	−
82	Preg. 90 days	+	Preg. 117 days	+	Preg. 166 days	+++	Dry; not tested		Dry; not tested	
84	Calved 11-10-31 Not pregnant	+	Preg. 7 days	+++	Preg. 56 days	+	Preg. 88 days	+++	Preg. 115 days	+++
86	Calved 9-28-31 Not pregnant	−	Not pregnant	−	Not pregnant	−	Not pregnant	−	Bred June 29	−
88	Preg. 120 days	−	Dead							
89	Calved 1- 4-32 Open	−	Open	−	Preg. 37 days	+	Preg. 69 days	+	Preg. 96 days	−

91	Calved 12-13-31 Open	−	Open	−	Preg. 37 days	−	Preg. 69 days	−	Preg. 96 days	−
92	Calved 11-10-31 Open	++	Open	+	Open	+++	Preg. 28 days Bred May 27	+++	Preg. 55 days	−
94	Calved 9- 8-31 Open	−	Open	−	Sold					
97	Calved 3- 3-32 Open 5 days	+++	Open	±	Open	−	Open	++	Open	−
98	Calved 3- 5-32 Open 3 days	+++	Open	++	Open	−	Open	±	Open	−
100	Calved 10-15-31 Open	−	Open	−	Preg. 12 days	+	Preg. 44 days Bred May 11	−	Preg. 71 days	−
101	Calved 11-26-31 Open	−	Open	+++	Preg. 2 days	−	Preg. 34 days Bred May 25	−	Preg. 61 days	−
103	Aborted 12-4-31 Preg. 15 days	+	Preg. 41 days	+++	Dry; no sample					
106	Calved 9-20-31 Open	+	Open	−	Open	+	Bred June 9	++	Open	−
109	Calved 8-22-31 Open	++	Open	++	Open	++	Bred June 16	++	Preg. 36 days	+++
110	Calved 11-23-31 Open	++	Open	++	Open	++	Bred June 12	++	Preg. 40 days	−
		45% accurate		63% accurate		61% accurate		50% accurate		50% accurate

alcohol test affords a simple and sure means for the diagnosis of pregnancy.

In a study of 77 pregnant and 143 non-pregnant animals no correlation was found between the alcohol test and pregnancy. Approximately one-half (57.3 per cent) of the non-pregnant animals gave positive reactions, and 70 per cent of the pregnant cows gave positive reactions. As a higher percentage of positive reactions was found in pregnant than in non-pregnant cows, it is probable that pregnancy may influence the test. If it is operative, however, it acts only as a remote cause, because many pregnant cows, even in advanced pregnancy, fail to give a positive reaction and approximately 50 per cent of the cows not pregnant give a positive reaction.

In some herds a higher percentage of positive reactions was found in both pregnant and non-pregnant cows than in other herds.

There may be considerable variation in the reaction of the milk of certain cows when the milk is tested at month intervals, even though the breeding status of the animal does not change. While some individual cows may continue to give the same type of reaction from month to month, some pregnant animals may be positive one month and negative the next. Likewise, non-pregnant cows may be negative one month and positive the next.

The basis for establishing pregnancy, in this study, was by rectal palpation at 60 to 90 days following service, and although some criticism may be made against this method as compared with actual calving dates, it has been found through experience that rectal palpation affords a highly accurate method of pregnancy diagnosis in cattle.

From this study it may be concluded that the alcohol test of milk is not a reliable guide in the diagnosis of pregnancy in cattle.

REFERENCES

[1]Farrington, E. H., and Woll, F. W.: Testing Milk and Its Products. (Madison, Wis., 1911.)
[2]Ayers, S. H., and Johnson, W. T.: U. S. Dept. of Agr. Bul. 202 (1915).
[3]Ernst, Wm.: Milk Hygiene. (Translated and edited by J. R. Mohler and A. Eichhorn.) (Alexander Eger, Chicago, 1915.) p. 214.
[4]Sommer, H. H., and Binney, T. H.: Jour. Dairy Sci., vi (1923), p. 176.
[5]Metzger: Cited by Sommer and Binney: Idem.
[6]Auzinger: Idem.
[7]Henkel, Metzger and Auzinger: Idem.
[8]Linkies, G.: Berl. Tierärzt. Wchnschr., xlvi (1930), 15.
[9]Dahlberg, A. O., and Garner, H. S.: U. S. Dept. of Agr. Bul. 944 (1921).
[10]Auzinger: Cited by Dahlberg and Garner: Idem.
[11]Sommer, H. H., and Hart, E. B.: Jour. Biol. Chem., xl (1919), 1, p. 137.

IDIOPATHIC HEMORRHAGIC HEPATITIS OF SWINE*

By A. H. QUIN, JR., *Des Moines, Iowa*
and J. D. SHOEMAN, *Dallas Center, Iowa*

During the summer of 1931, it was our pleasure to observe and study a peculiar and etiologically obscure swine disease occurring in the Hampshire herd of Mr. H. L. Neff, a prominent Dallas County (Iowa) farmer. Because of its unknown cause, constancy of hepatic involvement and septicemic character, we believe that for want of a better term, the designation, idiopathic hemorrhagic hepatitis is specifically descriptive.

Available references describing specific porcine hepatites affecting swine on a herd basis are very scanty. Semmer[1] records an enzoötic hepatitis that caused great losses among eight-week-old pigs in Russia. Nonewitsch[2] isolated a coccus from such cases and is said to have reproduced the disease after an incubation period of several weeks. He hinted that the Russian-type hepatitis might be an aftermath of navel infection. Brädel[3] has cited extensive enzoötic losses among East Prussian pig herds which he classified, pathologically, as *hepatitis hemorrhagica mortificans*. He disassociated the etiology of the disease from cysticercosis and distomiasis but thought that it might be, in some way, interrelated to hog cholera. Moussu connects the European liver disease of pigs with catarrhal enteritis associated with *B. pyocyaneus* infection. More recently, Mr. Guy Bush, an American swine husbandry specialist lately returned from service to the coöperative farms of the Soviet Republic, mentioned extensive losses in their spring pig crop from a "big liver" disease. He also stated that his Russian veterinary consultants were unacquainted with its etiology.

When given a description of the liver disease which we now plan to outline, several veterinarians, both in practice and abattoir inspection, recognized it but were unable to throw any light on the cause. Dr. S. H. McNutt, research pathologist at Iowa State College, states that several years ago the disease was common enough in northwestern Iowa to merit a request for research investigation.

HISTORY

We first visited the Neff herd on July 14, 1931, when we obtained the following history: The 18 cholera-immune sows farrowed an average of eight pigs per litter. Later the pigs were

*Presented at the sixty-ninth annual meeting of the American Veterinary Medical Association, Atlanta, Ga., August 23-26, 1932.

moved, according to the McLean County plan, to a 20-acre alfalfa pasture, where they were still confined at the time of our visit. No losses from suckling anemia, scours or other contagious, neonatal infections occurred during the suckling period. A few pigs with navel-ill were destroyed early in life.

The 137 pigs had grown well and averaged over 60 pounds by mid-July. The ration consisted of good quality oats, ear corn and tankage. In addition the herd had access to a complex mineral mixture. The water supply was adequate and of good quality. At night the pigs had access to individual hog-houses.

The first death in this herd occurred on July 10. On July 14, the day of our visit, two pigs had died after a visible illness of not over one day's duration.

FIG. 1. Idiopathic hemorrhagic hepatitis. The liver of this 60-lb Hampshire pig is larger than that of an aged sow.

SYMPTOMS

A careful sorting of the bunch revealed one visibly sick pig and a few others that seemed a bit "slow." The sick pig walked slowly when moved, was very depressed and was inclined to lie down in a sternal position at the first opportunity. There was no evidence of diarrhea, the nose was clean and the respiratory movements were not "thumpy" in type. The abdomen appeared enlarged as in ascities. The temperature was 105.5° F.

Autopsy Findings

An autopsy was held on this pig and on the two that had already died. The lesions were identical in all three with the exception that the sick pig destroyed for autopsy did not have the petechiae of the lungs and was not icteric. The component lesions noted were that all body lymph-glands were actively hyperemic, somewhat swollen and many of them revealed petechial hemorrhages of the parenchyma. Numerous petechiae were present on the kidneys, bladder, serous membranes and the upper heart. There was an excess of pericardial and peritoneal fluids. The spleen was not enlarged but was moderately darkened. The stomach was full of feed. The gastric mucosa and that of the duodenum was deeply inflamed and this inflammation was of the hemorrhagic type. The colon revealed a slight, catarrhal inflammation with a few hemorrhages. A few ascarids and whipworms were noted. The carcasses of the two pigs found dead were icteric.

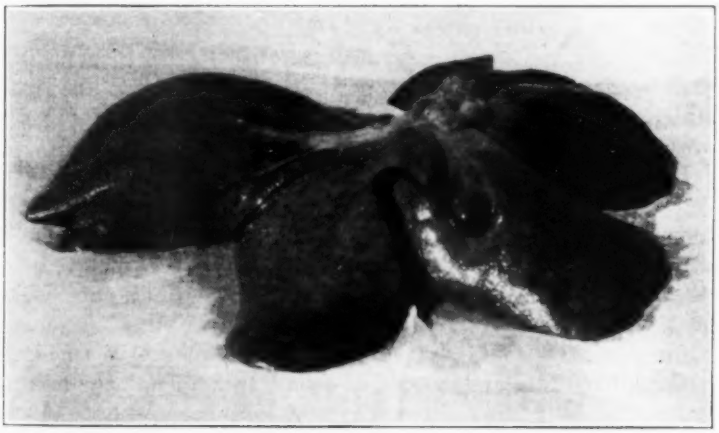


Fig. 2. Typical liver, showing hypertrophy and variegated, "speckled" appearance. Note distended gall-bladder.

However, on these as on all subsequent necropsies, the outstanding and immediately visible lesion was the greatly enlarged and vari-colored liver. So great was this hepatomegalia that the organ appeared to occupy a great share of the anterior abdomen. When the belly wall was laid back, the parietal faces of the liver appeared to carry countless red dots slightly larger than pin-heads. These hemorrhagic-appearing lobules were in-

terspersed with the normal, purple-colored lobules giving the affected liver a speckled or raspberry-jam-like appearance. When cross-sectioned and squeezed, an abundant amount of pink fluid resembling dilute red ink was exuded. The pathological change involved all sections of the liver with equal severity. The gall-bladder was distended but the bile was of near-normal consistency and color.

TREATMENT

Because of the extensive septicemic lesions noted in this non-immune herd, the pigs were immunized with anti-hog cholera serum and virus on the same day (July 14). The serum dosage was increased 50 to 75 per cent. During the handling, a few pigs with high temperatures were detected.

Death losses abated until the peak of the reaction period following administration of the serum and virus, namely, the seventh to tenth day. During this three-day period seven pigs sickened and died. In no instance was the illness of over two days' duration and postmortem examination of the seven dead pigs showed the enlarged livers, septicemia and gastro-enteritis noted on the original autopsies.

No further losses occurred until August 1, the 16th day following immunization, when one pig died showing the usual symptoms and lesions of hemorrhagic hepatitis. One pig died on August 8 and another on August 9. Both showed characteristic symptoms and lesions, including enlarged livers.

At this time we thought that a phytogenic factor might be responsible, although the alfalfa on the range was of good quality and quite free from weeds. Hence the pigs were removed to a clean, dry lot. The ration was restricted to whole oats soaked with a commercial alkaline mixture. This mixture, used in a dilution of 1:120, contained guaiacol sulphonate and the hydrate, bicarbonate, sulfate and chlorid of soda. In addition, the mixture was fortified by adding three drams of sodium phosphate to each hundredweight of live pigs. A stock solution containing one pint of tincture of iodin and two ounces of potassium iodid with water. q.s. one gallon was prepared. Six ounces of this solution was added to the daily allotment of drinking water. At the end of ten days, the general condition of the herd was good but sporadic cases continued to appear. This continued appearance of new cases on the dry lot ruled out the plant poisoning and mixed rations as a cause of death. Hence the pigs were returned to the alfalfa pasture. The losses dwindled and appeared sporadically until after September 1. No further losses oc-

curred and the balance of the herd was marketed in good time at top weights.

CONFIRMATION

On August 10, three affected pigs were taken to Dr. S. H. McNutt, at Iowa State College. His confirmatory findings are attested by the following notes kindly furnished by him:

Examination of first live pig: Inactive, standing wherever placed with head down and front legs spread well apart. Shoulders down, back up. Eyes bright and no evidence of diarrhea. Pig in fair flesh. Temperature, 104° F. Blood light colored. Lymph-glands of the throat, somewhat enlarged. Lymph-glands of the thorax, badly congested, as were those along the abdominal aorta and its major branches. The mesenteric lymphatics were normal. The heart was flabby and the lungs normal. The stomach showed some traces of blood in the fundus and was full of feed. There were a few traces of blood over some parts of the colonic mucosa. Kidneys were very pale, each showing eight or ten small but well-developed petechiae. A few small petechiae were noted on the mucous membrane of the empty bladder. The liver was greatly enlarged, moderately firm, each lobule being distinctly marked off. Many lobules showed central hemorrhages. Otherwise the liver was light colored, and from its cut surface the squeezed-out fluid looked like blood but was very thin and watery, evidently from extensive edema not markedly visible on the gross but easily seen on microscopic sections.

The lesions of the second pig were identical with those heretofore mentioned except that the mucous membrane of the colon was slightly swollen and there was considerable fluid in the peritoneal cavity. The third pig, which died en route to the laboratory, revealed identical lesions but with more blood in the stomach and intestines.

HISTOLOGIC LESIONS

A study of the micropathologic changes in these enlarged livers clearly indicated and confirmed the lesions found in gross specimens. There was no marked increase in the amount of interlobular connective tissue. There was, however, some interstitial edema which accounted for the separation of lobules seen on the cut surface of the liver and, in part, for the large amount of bloody fluid that could be squeezed out of the organ. Other changes consisted of a central necrosis, fragmentation of liver cells and hemorrhage into the central, necrotic portion. This central hemorrhage contained considerable numbers of white cells, none of which were eosinophilic. The distribution of blood cells was uniform throughout the hemorrhagic areas. The lobules still showed a marked ring or sphere of normal hepatic cells about the outer margins of the lobules, separated from the central hemorrhagic area by a zone of degenerating liver cells and edema.

From the interlobular connective tissue to the central vein the lesions were, therefore, made up of the following zones in the order given:

1. Edematous interlobular connective tissues not increased in amount.
2. A zone of relatively unchanged liver cells.
3. A zone of edema and degenerating liver cells.
4. The central hemorrhagic area surrounding the central vein.

It is evident that destruction of the central cell nests resulted in rupture of the capillaries and subsequent hemorrhage.

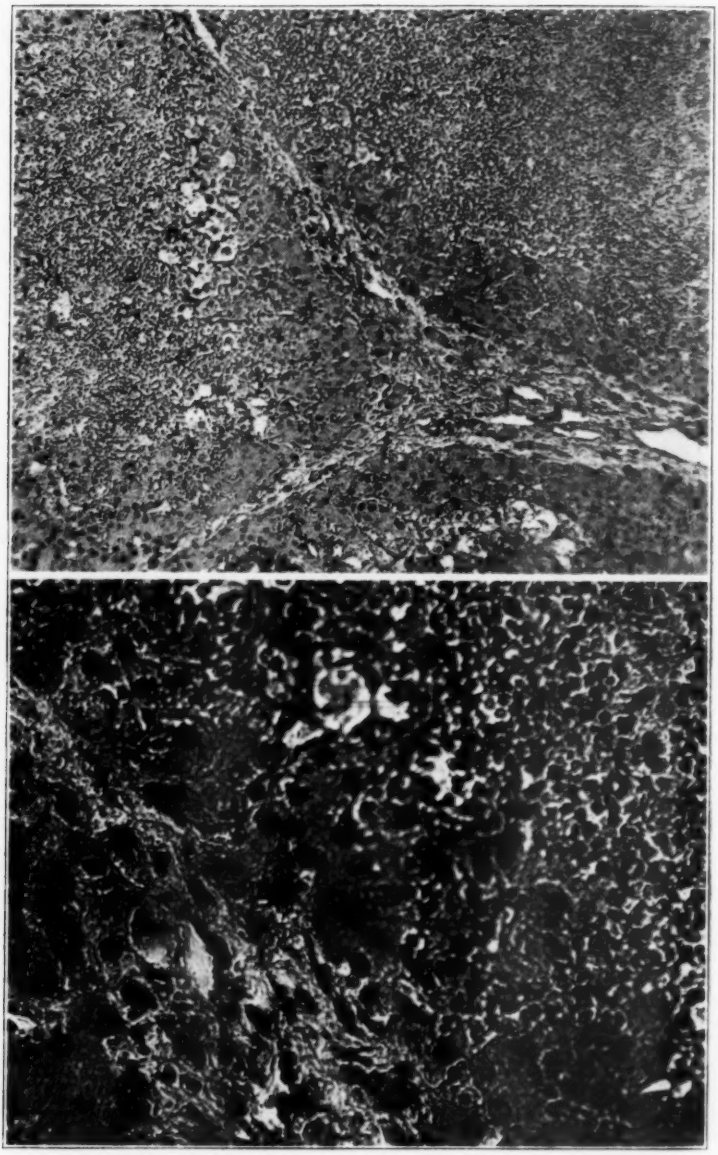


FIG. 3 (above). Three lobules showing typical lesions of hemorrhagic hepatitis: edematous interlobular connective tissue, outer zone or ring of normal liver cells, and central area of hemorrhage (x 125).
FIG. 4 (below). Margin of lobule from figure 3 (x 475).

Laboratory Studies

Smears from the intestinal mucosae of two typically affected pigs revealed a considerable number of loose, epithelial cells and leucocytes but no protozoa.

Cultures from the livers, spleens, mandibular, prepectoral and mediastinal lymph-glands and the blood showed no growth. In a separate specimen a culture of *Staphylococcus albus* of no consequence was isolated from the liver.

Portions of liver and blood from the two pigs with hemorrhagic hepatitis were mixed and ground to a fine paste but not filtered. Two pigs, susceptible to hog cholera, were injected intraperitoneally on August 11, each with 2 cc of the ground liver and blood mixture, with the results shown in table I.

Table I—*Inoculation experiments.*

Date	Temperature (F.)	
	Pig A	Pig B
8–11–31	101	102.3
8–12–31	101.2	103
8–13–31	101.8	102.2
8–14–31	102	102.6
8–15–31	101.6	102.8
8–16–31	104 (hot afternoon)	102.6
8–17–31	103.8 (not eating)	104.4
8–18–31	104.2 (not eating)	102.8
8–19–31	104.5 (not eating)	102.8
8–20–31	104.4 (eating)	102.7
8–21–31	102.2	102.4
8–22–31	102.2	101.8
8–24–31	O. K. Killed. No lesions	101.6
8–25–31		101.3
8–29–31		Continued to be O. K.
9– 3–31		Still O. K. Returned to herd

Pig A developed a temperature of 104° F. on August 16, five days after inoculation. Between August 16 and 20, his temperature ranged between 104 and 104.5° F. From August 17 to 20, the pig refused food. The temperature and general health returned to normal on August 21 and it was killed for study on the 24th.

A very detailed autopsy showed the pig to be normal. In order that nothing might be overlooked, microscopic sections were made from various internal organs. Careful examinations of these sections revealed nothing that might be traceable to the injected liver and blood mixture.

Pig B also gave a normal temperature curve until the seventh day, when it rose to 104.4° F. However, the pig continued to eat on this day and on all subsequent days until September 3, when it was returned to the herd.

Pigs A and B, mentioned in the preceding paragraphs, were from a lot that was being used in testing for the presence of hog cholera virus. None of the pigs in this lot had proved to be resistant to the virus and for this reason the two test pigs were not tested with virus of known virulence at the termination of the experiment. It is possible that the extremely hot summer weather during the period of the experiment was responsible for the malaise and febrile reaction of pig A. It was destroyed not because it was sick but to assure us that we were not overlooking any tissue change.

Drs. McBryde and Cole, at the U. S. Experiment Station, Ames, injected another susceptible pig with liver tissue from a typical case. This pig remained well throughout the necessary period of observation.

ANOTHER CASE

During the month of June, 1932, Drs. McBryde and Cole encountered livers of this type in three pigs from a Marshall County (Iowa) herd. These pigs were heavily parasitized with ascarids but, in addition, showed septicemic changes and hemorrhagic enteritis. The death loss in this herd totaled 24 pigs out of a herd of 100. According to the local veterinarian, Dr. R. M. Allen, the losses abated after immunization with anti-hog cholera serum, elimination of ascarids, administration of intestinal antiseptics, and a change to different ground. Histologic sections of the livers revealed identical pathology with that of the Neff herd.

CONCLUSIONS

While several specific diseases affecting the livers of pigs are recorded in the literature, including cysticercosis, trematode infestation, ascariasis, etc., their symptomatology, lesions and histologic findings are not the same as in this outbreak of idiopathic hemorrhagic hepatitis. This is confirmed further by a rather distinct absence of eosinophilia in affected livers.

Heavy losses in pigs after ingestion of velvet beans (*Mucuna utilia*) occur in some sections of the United States but the pathologic lesion is a yellow atrophy. Lupines also cause hepatic lesions, as do many of the organic and inorganic chemical poisons.

The liver disease described here killed pigs after an average illness of not over two days' duration. In the absence of poisonous plants, faulty rations, and a causative virus on inoculation tests, and with the bacteriologically negative findings we suggest that idiopathic hemorrhagic hepatitis be classified as a true toxemia. The specific nature of this toxemia is unknown.

SUMMARY

Thirty-two otherwise healthy pigs in a herd of 130 died, after an average illness not exceeding two days, with a disease characterized by septicemia, gastro-enteritis and hepatomegalia, with intralobular hemorrhage and necrosis. In the absence of positive bacteriologic findings and negative results from inoculation of three cholera-susceptible pigs, the writers conclude that the disease classifies as a true toxemia of unknown etiology.

ACKNOWLEDGMENTS

The authors express their sincere appreciation to Dr. S. H. McNutt, research pathologist at Iowa State College; to Dr. H. C. Smith, assistant laboratory director, Fort Dodge Serum Company, and to Drs. C. H. McBryde and C. G. Cole, of the United States Swine Experiment Station, Ames. We also thank, most sincerely, Mr. H. L. Neff, owner of the herd, for his generosity in furnishing autopsy subjects.

REFERENCES

[1]Semmer: Cited by Hutyra, F., and Marek, J.: Special Pathology and Therapeutics of the Diseases of Domestic Animals. (3rd ed., Alexander Eger, Chicago, 1926.) ii, p. 441.

[2]Nonewitsch: Idem.

[3]Brädel: Idem.

DISCUSSION

DR. A. T. KINSLEY: The authors have given a splendid description of this condition. I recall one instance, in south central Nebraska, where quite a lot of young pigs were lost, and the only condition found was this liver lesion. I am not so certain that I have the ability to question the name of the disease, but I was rather of the opinion that the condition was one of engorgement or congestion rather than inflammation. Your attention is called to the fact that when an organ of the magnitude of the liver becomes inflamed, a high temperature, 107, 108, can be anticipated, and therefore, the name applied to this malady is questioned. My judgment is that the condition is a congestion incident to toxic substances taken through the liver by the portal vein, and I think that when the slides are shown this will be evidenced by the engorgement of the perilobular veins, which may be followed by necrosis of the central part of the lobule. Central necrosis may destroy the central blood-vessel and result in hemorrhage. The condition is probably primarily a toxemia.

In the instance mentioned, there was no difficulty in preventing further losses by change of diet, although this did not follow in this particular herd observed by Dr. Quin. We were under the impression

that the condition was a toxemia originating from the digestive tract and entering the liver through the portal vein.

Recently there has been encountered a similar condition in calves, an acute, marked congestion of the portal circulation, followed by central necrosis.

DR. QUIN: Dr. Kinsley, I agree with you that the name may not be correct. It is true that your micropathology is right, first, the rupture of the central lobular vein, then a hemorrhage plus the subsequent necrosis, so the name probably should be changed to idiopathic hemorrhagic "whatever the name is" for congestion of the liver.

DR. KINSLEY: I want to take issue with the statement that inflammation is necessarily incident to necrosis. In fact, I think necrosis is a result of obstructed circulation rather than of increased circulation.

DR. QUIN: Since you have taught me all the pathology I know, which is very little, I shall not differ with you on the subject.

DR. R. W. HIXSON: I should like to ask Dr. Quin if he has any idea of whether or not this might be related to protein. I had a case in which I vaccinated 402 pigs that weighed about sixty pounds. The owner turned them out to a self-feeder full of tankage, and they were supposed to go down across the cornfield to a little alfalfa field. They did not go. About four or five days later, there were more than 100 dead pigs, for exactly the same reason that Dr. Quin gives. After we took them off the protein and gave them a laxative they got all right, and we had no more trouble.

DR. QUIN: Dr. Hixson, when the pigs in the Neff herd came down in that dry lot, over a ten-day period, they were getting nothing at all to eat except water and oats soaked in an alkaline solution, and I do not believe the protein content of the oats was sufficient to cause this trouble. That would be a light ration. But I have a little hunch that perhaps this thing may be associated in some way with grazing on legumes, particularly clover. I saw this thing once, years ago, in pigs that were running to sweet clover, and we know that we have sweet-clover poisoning in cattle from second cuttings of hay. There may be a hemolytic principle about legumes that we still do not understand. This was a case report, not an extended experiment, and it was presented only that something might be in the literature. I trust that other veterinarians will confirm the findings and possibly throw some light on causation.

DR. B. E. CARLISLE: Expressing an opinion based on my experience with swine practice, I would say that I do not believe that it is connected with protein poison. My experience with protein poisoning, from such things as beans and other foods with high protein content, has not revealed any such pathology as has been described in this case. I have had cases of protein poisoning where, with a change of food and the administration of a laxative, the condition was corrected but the pathology was entirely different.

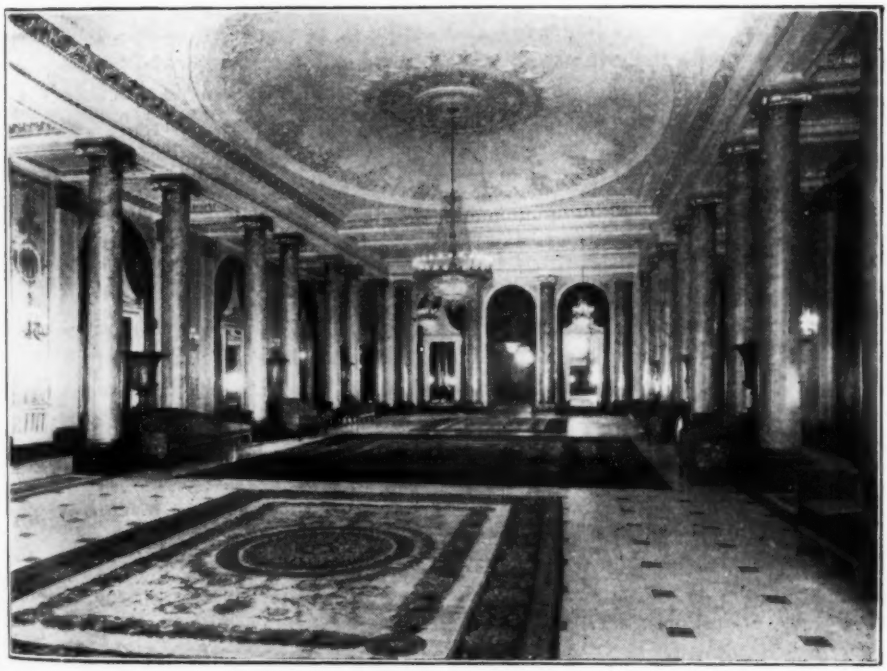
DR. QUIN: I might add something which impressed me about this particular case. There is one thing shown in the inoculation of those two pigs with liver and blood mixture. Three weeks after they were immunized with serum and virus, we got no reproduction of the disease in those susceptible pigs. This might tentatively show that, at the end of 21 days, vaccination virus is no longer a factor in the spread of hog cholera.

DR. CARLISLE: There is just one other thing in connection with the paper and the reference made to the possibility of a connection between this disease and grazing on legumes. It was my privilege during the past winter to observe a very peculiar nervous manifestation in a herd of swine that was grazing on Austrian peas. These Austrian peas were sown in a pecan grove. It was not by choice that these swine consumed the peas—they do not like them—but on account of

short feed and the lack of other grazing crop at that time they did graze on these peas and following it there was a chronic nervous disorder manifested in the gait of these swine. You could see it as they walked and it was more pronounced when you made them trot or run away. Although later the diet was changed and the season changed the crops, some of those hogs, which are now matured sows, still show signs of this condition. I just mention that to connect it up with grazing on legumes.

Lake County Accredited

Lake County, Illinois, has been added to the list of counties accredited as tuberculosis-free, after a long, hard fight, started in 1924, when the estimate of tuberculosis infection among the herds of the county was placed at 55 per cent. Dr. Thomas P. Gallahue (Chi. '17), County Veterinarian, has conducted the work for the past five years.



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70th Annual A. V. M. A. Convention

August 14-18, 1933

INFECTIONS OF FETUSES AND FOALS*

By W. W. DIMOCK *and* P. R. EDWARDS
Department of Animal Pathology
Kentucky Agricultural Experiment Station
Lexington, Kentucky

Diseases of the newborn have been the subject of extended study for many years. In live stock production it is well known that abortions and diseases of the newborn constitute a source of serious economic loss. In groups of animals maintained for breeding, it often has been observed that there is a close correlation in the occurrence of delayed conception, sterility, abortion, stillbirths, and diseases of the newborn. With particular reference to horses it has been demonstrated that infections of the genital tract of mares and stallions, together with faulty practices in breeding hygiene, have a direct relation to many cases of abortion and to diseases of the newborn. The control of genital infections in mares and sanitary precautions at time of service will help materially to reduce the occurrence of these conditions. There are some cases of abortion and some diseases of foals that are directly the result of bacteria existing in the genital tract of the mare before conception or introduced at the time of conception. There are other cases where abortion and disease of the newborn are the result of infections or disturbances due to non-infectious factors occurring some time during the period of gestation, that is, following conception and previous to parturition.

Streptococcic infection in the newborn, *Shigella equirulis* infection in the newborn and *Salmonella abortivo-equinus* infection in the newborn are often antepartum in origin. The first, as a prenatal infection of foals, is, as far as known, the result of an infection existing or established in the genital tract of the mare at the time of service. The two latter, as prenatal infections of foals, are, as far as known, the result of intraüterine infection established following conception. All these may occur as postnatal infections of foals although probably less frequently than generally supposed. A further point that must be recognized is that abortions and diseases of the newborn in the equine species are as distinct etiologically as are infections and diseases in the adult animal. Until this fact is understood and methods of

*This paper reports the investigation in connection with a project of the Kentucky Agricultural Experiment Station and is published by the permission of the Director. Presented at the sixty-ninth annual meeting of the American Veterinary Medical Association, Atlanta, Ga., August 23-26, 1932.

prevention are so based, little or no progress will be made in dealing with them.

In diseases of the newborn, symptoms peculiar to each type of infection are in most cases distinct. The pathological lesions produced are in many cases distinct and uniform to the extent of being pathognomonic. However, they are not sufficiently characteristic in all cases and under all conditions to warrant a diagnosis without resort to a bacteriological examination. Therefore, in the examination of foals, postmortem and cultural methods need to be carried out in every case when possible, if serious errors are to be avoided. It must be remembered, however, that in only a small percentage of the cases of disease of the newborn is it possible to have a laboratory examination made. Thus the clinician, in most cases, must depend upon his own observation and experience in classifying these diseases. It is for this reason that attention is called to the fact that a knowledge of the history, symptoms and lesions of foals sick from the different types of infection often presents a symptom complex sufficiently distinct and characteristic to be of diagnostic value.

Preventive Measures Based on Cause

As research workers it is our objective to determine the cause and nature of the disease. Upon the basis of the determined facts preventive measures are outlined. It falls to the practitioner to apply the preventive measures in an effective and practical way. The word practical is used because it must be realized that the established routine procedure of the breeding establishment should not be seriously disarranged. On the other hand, the application of the preventive measures must be effective, otherwise it had best not be undertaken.

To make preventive medicine effective as applied to abortion and diseases of the newborn, there must be full coöperation between the veterinarian and the management. Success will depend not only upon a thorough knowledge of the fundamental facts and ability to interpret individual cases correctly but upon skill and perseverance in application.

From an examination of aborted fetuses it was determined that, out of 386 subjected to a detailed bacteriological examination, 230 (60 per cent) were negative. Twin abortions composed 25 (6.5 per cent), all of which were negative. From 96 (24.8 per cent) streptococci were isolated. From 22 (5.7 per cent) *S. abortivo-equinus* was isolated. From 6 (1.5 per cent) staphylococci were isolated. From 4 (1.0 per cent) *Escherichia coli* was recovered, and from 2 (0.5 per cent) *S. equirulis* was iso-

lated. It is seen that a majority of the fetuses examined, exclusive of twin abortions, were bacteriologically negative on the basis of the examinations. It is felt that, in some of the fetuses recorded as negative, abortion was actually due to infection; particularly to streptococcic infection. In some cases in which the fetus was negative the chorion showed pathological changes and streptococci were obtained on culture. Also, in these same cases, the mare had streptococcic metritis. Had it been possible to have all the placentae for study and to have examined every mare, no doubt the number of abortions recorded as bacteriologically negative would have been less and the number due to streptococcic infection increased.

Abortions of Obscure Etiology

In the case of *S. abortivo-equinus* the 22 fetuses presented for examination came from five outbreaks. In one outbreak 40 out of approximately 100 pregnant mares aborted, although only 6 fetuses were examined bacteriologically. In a second outbreak only one fetus out of 15 abortions was available for study. The total number of abortions in mares due to *S. abortivo-equinus* that came under our observation was approximately 100. We have found *S. equirulis* infection in fetuses to be most unusual although some reports in European literature seem to indicate that it not uncommonly causes abortion. During the last ten years, we have encountered a number of outbreaks of abortion among mares that were from all angles of approach not due to any of the known bacteria found in abortion of the equine species. Nine distinct outbreaks of abortion in mares were studied with the result that in not a single one could an infectious agent be demonstrated either through cultural methods or experimental inoculation of pregnant mares and laboratory animals. In 6 of the 9 outbreaks, the percentage of mares that aborted was high; in one case it was 9 out of 13, in another 12 out of 20, and in a third 10 out of 14. In three instances the number of mares that aborted was small, compared with the total number on the farm. However, in three instances the abortions all occurred within a short time and seemed to have a common origin.

All mares in the so-called negative outbreaks of abortion, with the exception of one group, had been vaccinated against *S. abortivo-equinus* infection. All of the vaccinated and non-vaccinated mares were negative to the agglutination test for *S. abortivo-equinus*, following abortion. In non-vaccinated mares that have contracted *S. abortivo-equinus* infection the blood titre will be from 1:1,000 up to 1:10,000. In vaccinated mares the titre sel-

dom goes above 1:500; usually 1:350 or 400. Normal horse serum agglutinates *S. abortivo-equinus* antigen from 1:100 up to 1:200, probably never higher than 1:200. In all the non-infectious outbreaks the mares showed no symptoms of approaching abortion, were not physically sick following abortion and the genital tract returned to normal fully as rapidly as following a normal parturition.

Examination of Foals

A postmortem and detailed bacteriological examination was made on 273 foals. The foals varied in age from those dead at birth up to eight months. As a routine procedure culture tubes were inoculated with material from all the internal organs and from the joint cavities of the legs. Occasionally the brain, cord, lymph-glands, testes, ovaries and uterus were cultured. From 110 (40.3 per cent) *S. equirulis* was recovered. From 65 (23.8 per cent) a streptococcus was isolated. Other microörganisms found, but less frequently, were *Esch. coli* in 13 cases, *S. abortivo-equinus* from 6, *Corynebacterium equi* from 5, and from 11 cases the results are recorded as miscellaneous. There were 53 (19.4 per cent) that were bacteriologically negative and for which no cause of death could be demonstrated. Ten other foals were examined that showed no evidence of infection. However, in five of these, death was due to traumatic injuries and in the other five, death was the direct result of dystocia.

If the 63 foals negative on culture are deducted from the total examined, it leaves 210 (approximately 77 per cent) in which death was evidently due to infection. Of this number, 110 (52 per cent) were found to be infected with *S. equirulis*, and 65 (30 per cent) with streptococci. Therefore, in diseases of the newborn of the equine species it is shown that infection was the cause of death in 77 per cent of the total examined and that 82 per cent of the 210 cases of infection were due to two types of microörganisms, namely, *S. equirulis*, 52 per cent, and streptococci, 30 per cent. Of the bacteriologically negative cases there remain, after eliminating those due to traumatic injury and to dystocia, 53 for which the cause of death is undetermined.

A considerable percentage of the negative foals were dead at birth, and others died almost immediately after delivery. Some may have been the result of delayed parturition and perhaps in a few instances to lack of attention. However, this explanation has never been accepted as satisfactory. The apparently normal foal carried full term and delivered without untoward incident,

which has not breathed, together with the cases of negative abortions previously referred to, stand out as a challenge to our best efforts. The answer lies, we believe in the twilight zone yet to be determined: when strictly physiological processes in reproduction leave off and when pathological processes have their beginning.

Of the foals examined, a large majority were classified under three headings: those bacteriologically negative, those infected with streptococci, and those infected with *S. equirulis*. The age at death of each group is given in table I. Two negative foals, one foal infected with streptococci and two foals infected with *S. equirulis*, are not included, since their ages were not known.

TABLE I—*Age of foals at death.*

Result of Bacteriological Examination	Age at Death (Days)								Total
	1	2	3	4	5–7	8–14	15–30	Over 30	
Negative	45	1	2	1	1	4	3	4	61
Streptococcus	15	4	2	3	6	9	9	16	64
S. equirulis	39	14	10	6	6	2	4	28	108

Another very important problem in connection with diseases and infections of the newborn is the origin of the infection. The fact should be kept in mind that in many of the foals examined it was determined with finality that the infection had its origin previous to birth. This is especially true of *S. equirulis* and streptococcic infection. As prenatal infections, those due to streptococci probably always have their origin in the uterus of the mare. The microörganisms have become established in the uterus previous to conception or are introduced at the time of service. As the cause of prenatal infection, *S. equirulis* is apparently seldom if ever present as a uterine infection in the nonpregnant mare. While it must be admitted that it may be introduced at the time of service, our observations and studies indicate that this mode of entrance is not the principal one.

It is believed, although not definitely determined, that *S. equirulis* under favorable conditions gains entrance to the general or systemic circulation of the mare directly from the alimentary tract. Entrance may occur directly from the infected tonsilar region of the throat, through any slight abrasion or abnormality in the intestinal mucosa, but quite probably through inflammatory lesions in the cecum and colon due to injury from nematode parasites. It has been suggested that the larvae of the *Strongylus*

vulgaris, in their migration from the intestines into the systemic circulation, carry *S. equirulis*. We have found larvae of *Strongylus vulgaris* in the mesenteric arteries of a foal three weeks of age. In foals from four weeks to eight months of age well-developed verminous aneurysms are often found. *S. equirulis* has been isolated in pure culture from these aneurysms.

Whether the worm parasite actually carries the bacillus, on or in its body, to the blood-vessel or whether the bacillus enters the blood-stream by other means and later localizes in the diseased area is not vital to this discussion. However, in that the microörganism does find its way into the circulation of young colts, it may with equal facility find its way into the blood-stream of the brood mare. In mature horses there is a marked resistance or tolerance to *S. equirulis*. On the other hand, young colts are readily susceptible to infection with this microörganism. May it not be that *S. equirulis* finds its way into the blood-stream of the brood mare and through its predilection for the tissues of young equines readily finds its way to the fetus within the confines of the pregnant uterus?

Infections May Originate in the Mare

The statement has already been made that streptococcic infection of fetuses and streptococci as the cause of a prenatal infection of foals have their origin in the uterus of the mare. Thus it becomes important to know when and under what conditions streptococci gain entrance to the genital tract of the mare and become established to the degree of producing inflammatory processes. It has been observed that under normal conditions the healthy barren mare is highly resistant to the lodgment of streptococci in the deeper recesses of the genital tract. It has been observed also that the brood mare is more susceptible to streptococcic infection during the period intervening between parturition and the termination of the first estrual period than at any other time.

Injuries, of a minor or major character, to the structures of the genital tract at time of foaling materially increase the vulnerability of the genital tract to bacterial invasion. Cases of abortion due to streptococci and cases of streptococcic infection of the newborn have been found among mares that foaled the preceding year, have shown no clinical evidence of abnormality following parturition, have been bred on the first heat period and have conceived. New cases of streptococcic metritis of mares occur in those that gave birth to foals the preceding year, were

bred but failed to conceive. In the mare that had foaled the microörganism is present in the genital tract, in most instances, previous to the time of service. However, it may be introduced at the time of service, from streptococci present on the external genitals of the mare or stallion. Occasionally it may come directly from the semen of the stallion, when he is suffering from streptococcic infection of the reproductive glands.

Artificial insemination may be a means of introducing streptococci into the uterus of the mare. Streptococci, as the cause of metritis, as the cause of abortion, and as a prenatal infection of the newborn, probably always gain entrance to the uterus directly through the vulvo-vaginal canal. The infection is either present in the uterus when the mare is admitted to service or introduced at the time. The cervical canal of the pregnant mare is altogether resistant to invasion by streptococci. It is quite generally recognized that the mare which shows clinical evidence of metritis, after parturition, as indicated by the amount and character of exudate, is unfit to breed as soon as the ninth day following parturition and that for such cases treatment is advisable. On the other hand, it is not generally recognized that there are many externally non-clinical cases that are in an equally serious condition from the standpoint of streptococcic infection.

TABLE II—*Bacteriological examination of mares after foaling.**

DAYS	NEGATIVE	STREPTOCOCCUS	E. COLI	MISCELLANEOUS	TOTAL
1	3	10		1	14
2	6	8	3		17
3	6	20	1	1	28
4	13	18	2		33
5	9	8	1		18
6	4	7			11
7	11	9		1	21
8	7	7			14
9	4	2		1	7
Over 9	21	35		1	57
Total	84	124	7	5	220

*The mares represented in this table foaled normally at term and the foals were normal, healthy individuals.

In table II are given the results obtained from a bacteriological examination of the genital tract of 220 mares that had given birth, at term, to normal, healthy foals. The method of taking the cultures was the same as described in Kentucky Agricultural

Experiment Station Bulletin 286. The days after foaling on which cultures were taken and the results are given in the table. The results of these observations bring out the fact that over 50 per cent of the mares examined showed streptococci in the uterine excretion. The percentage that showed streptococci after the ninth day is somewhat higher than for those examined before the ninth day. This is to be expected, since in most instances they were mares that were bred on the ninth day but failed to conceive and mares that, because of their condition, were not admitted to service on the ninth day.

The two other most important microörganisms causing abortion and disease of the newborn are, in our opinion, post-conception infections, the mode of entrance being by the digestive tract and systemic circulation of the mare. For *S. abortive-equinus* this is well established. Definite knowledge of the method of infection with *S. equirulis* is yet to be obtained.

In view of the general interest in streptococci the following brief statement of our work with these microörganisms is included.

Streptococci

In the study of streptococci isolated from genital infections and prenatal diseases of the horse, the organisms were found to possess the characters that in the past have been generally attributed to human streptococci. The cultures were strongly hemolytic in fluid media, did not hydrolyze sodium hippurate, produced only a low acidity in glucose broth, and failed to reduce methylene blue. It was found possible to differentiate 95 per cent of these cultures from streptococci of human origin by their fermentative reactions. All of a series of 75 human strains were able to ferment trehalose while they failed to ferment sorbitol. In a series of 135 equine cultures, 129 were able to attack sorbitol but failed to ferment trehalose. The six remaining cultures resembled the human strains in their action on fermentable substances.

In our study of streptococci from cows, hogs, chickens, and foxes, these were found to resemble the group of equine strains described above; 95 per cent of them fermented sorbitol but failed to attack trehalose. *Streptococcus equi* can be distinguished from the human streptococci and the other animal strains by the fact that it ferments neither trehalose nor sorbitol.

There were 725 in attendance at the Chicago convention in 1909. The banquet was held in the famous Gold Room of the Congress Hotel.

PASTURE DISEASES OF SHEEP*

By W. H. LYTLE, *Salem, Oregon*
Division of Animal Industry, Department of Agriculture

In covering the pasture diseases of sheep, we desire to treat the subject by assuming that there are diseases of sheep that are found predominantly under range conditions, while those smaller farm flocks that yield perhaps more readily to veterinary intervention are pasture-run animals which have certain diseases that are not found so commonly in range animals, and may well be regarded as farm flock or pasture diseases. Nature has devised a scheme that gives place to but few errors. It is when the orderly and natural methods that Providence has installed are pushed aside and changed, so as to fit into some plan that man has formed, that we encounter disease and disaster in the husbandry of our domestic animals. The diseases of sheep are no exception, and are much the same in this regard as are those of other animals. Perhaps some may say we have not changed the physical make-up of our sheep so much as we have of some of our other domestic animals, particularly the dairy cow and some of the dual-purpose animals such as the milking Shorthorns. Yet we might speak, with good propriety, of some of our long-wooled breeds of sheep as triple-purpose animals, for from them we get wool, mutton, and enough milk to support twin lambs, which per weight of dam as compared with dairy cattle is quite in keeping with the milk-production of these larger animals though not for so long a period of time.

For convenience let us assume that we are dealing with a farm flock of 100 ewes that are bred to lamb in the middle of February. The owner is a better-than-average flockman. The ewes have been carefully selected with respect to their age. The owner knows that, speaking in year ages, yearlings have two lower central incisors, two-year-olds have four, three-year-olds have six, and four-to-five-year-olds show a full mouth, and after five years of age the teeth commence to wear and the sharp chisel edges become broken, and the ewe is then spoken of as "broken mouthed." This owner knows that two-year-old ewes are the most valuable because they have their lives before them, and that six-year-old ewes are worth less than half the value of the two-year-old ewes.

It is now the middle of January and the sheds have been placed in order; the manure accumulated during the summer before has

*Presented at the sixty-ninth annual meeting of the American Veterinary Medical Association, Atlanta, Ga., August 23-26, 1932.

been carefully cleaned out and hauled to the fields, the shed-walls have been whitewashed to cover over the accumulated dirt of the year before and to afford better light-reflecting surfaces, for sheep barns as a rule are low of ceiling and often not well provided with window lighting space. The shed has been well supplied with ventilation by arranging the windows so that they fall in at the top and by using wide doors so that when warmer days are encountered the latter may be opened. The doors have been wisely placed on the windward side of the barn, to avoid direct drafts which are harmful to both the ewes and the lambs. The shed, through the wisdom of its builder, has been erected on a sloping hill that faces the south. Ample bedding has been provided through the piling of straw under one end of the shed.

The ewes of the flock are in full bloom and some 90 per cent will drop lambs, for the owner, although forced to mate his flock in the dry fall month of September, had the foresight to save one of his pastures that was low-lying and covered with lush grasses, that he might turn the ewes into it a week before, in order to flush them immediately prior to placing his four bucks in this enclosure. These bucks are taken out during the day and fed grain and placed with the ewes only at night. This flockmaster knows that it is necessary to get a high percentage of ewes with lamb and a large number of twin lambs if he is to mark out upwards of 130 per cent of lambs, which is necessary in order to make a satisfactory profit. Flushing the ewes on green pasture causes them to take on condition, and the vitamins and food units in the green grasses and in the germs of the grain given the bucks during their rest period increase the flock fertility and goes toward insuring a satisfactory lamb crop.

Genetics Neglected

The ability to raise a large number of twin lambs in the farm flock is often the deciding factor between success and failure. The bearing of twins and triplets, or multiparity, is a heritable tendency and not enough attention has been given to this branch of genetics by our American breeders of pure-bred sheep. In Europe, where every mouthful of feed must be accounted for, whole flocks of sheep have been built up from twin and triplet ancestry, both male and female, with the result that flocks of great prolificacy are to be found there. A great opportunity is now at hand for some ambitious American breeder to build up a twin-bearing strain of American pure-bred sheep.

With the twin-carrying and bearing ewe, let us start to consider some of the pasture diseases that we may encounter. The ewe flock has been tagged and the bags and under bellies have been sheared to lessen the likelihood of the young lambs taking wool into their digestive tracts and causing the wool-balls and digestive disorders that result when wool is mixed with clabbered milk in the lamb's stomach and churned into a ball. These ewes are coming three years old and they are at the height of their feeding capacity. They have been flushed and many are carrying twins in their sides. The owner is a good feeder and he has been generous with his hay. He has not neglected to take precautions against the goiter disease loss in lambs, as his farm is located in the goiter belt. He has fed iodized salt, mixing three drams of potassium iodid with 100 pounds of salt. The iodid first was mixed with some charcoal to give it a dark mixture color, then further mixed with a pound of table salt, and finally mixed with the 100-pound sack of salt.

Stercoremia

Somehow, one morning, two of the ewes were growing nervous. They had stopped eating and were clamping their jaws; a characteristic rich-sour odor was emanating from their bodies and they plainly were taking down with the so-called pregnant ewe paralysis or stercoremia. Exercise was suggested and also the feeding of cane molasses on the hay, which was ordered cut down in amount. The molasses was given for the purpose of increasing the water intake. Also it was advised that the drinking water be heated, as the cold spell had frozen the top of the tank and but little was being consumed. The disease was best described as an auto-intoxication caused by bowel stasis, due to pressure from the twin lambs in the side and the accumulation of omental fat, coupled with coarse foods with too little water intake due to the cold water in the tank. Medical intervention was thought unwise as only drastic purgatives could ill hope to afford relief. The ailing ewes were submitted to a cesarean section operation to effect delivery of the lambs and relieve pressure. The patients were too heavily auto-intoxicated to stand the shock. In these cases prevention is much easier than cure. Even with treatment a few more will die but this disease never would have happened if the ewes had been lambing on grass pasture as nature intended.

Finally all the lambs have been dropped. Their navel cords have been cut, leaving an inch stub, which has been dipped in

pure tincture of iodin. The stain on the belly shows that none have been missed, and the iodin on the surrounding skin has been absorbed, correcting any deficiency. No navel-ill has resulted, as the iodin-sealed cord has prevented this from taking place.

White Scours

One morning the lambs were subjected to a sudden change of temperature; a cold wind, followed by a few cloudy, cold, raw days, left several with a tucked-up-belly appearance, watery, inflamed eyes and a staring coat. Their temperatures were quite high and there was a soiling of the tail, caused by a whitish, watery fecal discharge. Plainly they had the troublesome white diarrhea. The blood has suddenly rushed to the abdominal organs to avoid the impending chilling that would result from the cold exposure and, in some manner, either through the lowering of body temperature or the spreading of the epithelial cells that line the intestinal canal, organisms present in the intestinal flora apparently have invaded the intestinal wall and set up the fatal enteritis. It would appear that the infection of white scours in less than week-old lambs is a disease that possibly is passed from the mother to the lamb *in utero*, similar in a way to the manner in which white diarrhea of chicks is passed. As a line of treatment nothing will prove of avail unless the lambs can be kept warm. Castor oil, charcoal tablets, bismuth, intestinal sedatives and the like may prove helpful, but a few hours in the sunshine will be the best prophylactic treatment for the exposed young lambs of the flock. If early winter lambing is to be resorted to, means of artificial heat must be provided, to save the lamb dropped during the cold spell. As a rule, lambs that can be carried past the four-day period after birth, without developing white scours, are quite safe and will withstand considerable exposure to cold after that time.

Sunshine Essential

Sheds should be provided with sunshine chambers arranged so that the window side projection or roof may be lifted up during clear days, so that the direct solar rays may exert their beneficial and health-giving powers on the young. It would be well to wall the sides of these chambers with a violet-ray-reflecting material, such as white ocean glue sanded paper, mirrors, polished metals or even whitewashed walls in which extremely fine white ocean sand has been mixed. This arrangement will make a southern California or Florida beach effect out of many a cold barn lo-

cated in the northern and colder climates. We must learn to use the sun and concentrate and intensify its rays if we are to move up the lambing time successfully. Perhaps anemia of lambs plays some part in white scours infection, for solar rays and soil contact, both regarded as the modern classical treatment for anemia of the newborn, are the real prophylactic panaceas for white scours and, for that matter, most all diseases of the young.

Necrobacillosis

In necrobacillosis—sore mouth of lambs and foot-rot of sheep—we find a food or vitamin deficiency or a food allergy that seems to be the predisposing factor. When drouth-weakened or deteriorated vegetation is used for forage purposes, the tissues break down and become infected with the ever-present necrophorus organism. Also, when animals suddenly are transferred from one type of feed to another, such as changing from wild or grain hays to alfalfa hay rich in protein, there results a food allergic reaction that causes a weakening and breaking down and abscessing of the tissues of the feet, mouth, intestinal canal, and sexual organs. Treatment through using dilute nitric acid, common vinegar, two per cent solutions of formaldehyde and tartar emetic paste will be slow and often unsuccessful unless the diet is corrected and succulent and well-balanced foods given.

Many disastrous dietetic conditions of sheep will be avoided, if, when radical sheep-feed changes are to be made, they be done gradually. At least a week should be allowed to change from one kind of feed to another successfully. Many of the so-called peculiar diseases of feeder lambs are but allergic food reactions produced by the sudden change to rich protein diets.

Mammitis

In mammitis, or what is commonly called "blue bag," we have a condition or udder infection not unlike the mastitis infections of cattle. The disease is predominantly a disorder of the well-bred, twin-bearing, high-milk-producing ewe. The malady is spread frequently by the "bummer lamb" which, on being forced to leave its infected mother, carries the infection to its foster mother. Both the infected ewe and lambs should be separated from the flock, and the lamb's body should be disinfected if placed on another ewe. Hot applications followed by phycamphol or phytolacca ointment, frequent milkings into a pail and destroying the milk, 2-cc doses of camphorated oil, Epsom salt internally, and daily graduated injections of camphorated oil will

serve as a satisfactory treatment. If gangrene is about to set in, a bold incision through one side of the teat, splitting the milk-duct flush up to the bag so as to give drainage, may save the udder and the ewe.

Coccidiosis

There are several types of coccidiosis. Some are pathogenic and others apparently are not. The infection will be recognized through the bloody liquid diarrhea, loss of condition, and high death-rate at the onset. Yearlings and mature sheep seem to contract the fatal form of infection. Treatment should be carried out by using molasses to support the body and cause an increase of water intake to flush out the large intestine. This should be supplemented with powered iron sulphate mixed with bran. The iron stimulates the production of blood and acts as a styptic on the intestinal tract. A frequent change of feeding ground will be necessary.

Hemorrhagic Septicemia

No discussion of sheep diseases is complete without considering hemorrhagic septicemia. The medical nomenclature has made this disease one that is both high-sounding and terrible. It might well be called the "omnibus disease," because it carries all. It does exist occasionally in sheep, but is not so common as it is thought to be. Young lambs moved in undisinfected cars and changed from green pastures to dusty ones seem to contract the infection most readily. The bacterin or, still better, the attenuated, live-organism vaccine treatment is the most effective. Placing the vaccine in the skin—making an intradermal injection—seems to afford the best protection. A fold of the dewlap or the caudal skin-fold works well.

Conjunctivitis in young lambs or bucks occurs frequently. It is often infectious and the secretions probably carry the disease to other members of the flock through the medium of dust. It will yield to the classical treatment.

We have omitted all mention of the parasitic infestations of sheep, as they constitute a subject too voluminous to cover.

It will be seen that, from the standpoint of the common pasture diseases of sheep, mortality may be greatly cut down through proper diet, sanitation, intelligent diagnosis and occasionally vaccination, but the greatest headway will be made by getting back to nature.

INTRAVENOUS THERAPY IN SMALL ANIMALS*

By E. J. FRICK, *Manhattan, Kansas*
Division of Veterinary Medicine, Kansas State College

The purpose of this paper is to call to your attention a long-neglected, valuable means of medication in small animals. Generally speaking, pharmacology and therapeutics have failed to keep in step with the forward march of many other branches of medical science. Recently, I have been impressed by a development in pharmacology that appears to be revolutionizing our art of therapeutics. I refer to the intravenous injection of many of our old and proven remedies. Intravenous medication is commonly practiced in human medicine and increasingly so in the treatment of our large animals. Its usage in small animals has not been generally followed. The reason probably has been the lack of information regarding the procedure of administration and perhaps a failure to appreciate its advantages.

In the dog the most favorable site of injection for intravenous medication is the external saphenous vein on the lateral surface just below the hock joint. Either an 18- or 22-gauge sharp needle will do, though the needle of smaller caliber is better on small dogs. The usual difficulty experienced in trying to puncture the vein is due to the rolling movement of the vessel away from a dull needle. This can be prevented by holding the vein between the thumb and forefinger at the time of injection and using a sharp needle with bevel turned upward. If the vein is missed, insert the needle a little higher up on the leg where the vein imbeds itself into the thigh muscles. In the front leg, the vein (*cephalica antebrachii*) passing down the front of the arm also lends itself for ready injection.

In the cat the medial saphenous vein seems larger and is preferred for injection purposes. In the rabbit and some other animals the auricular vein is the most acceptable site. Occasionally the jugular vein can be taken for the portal of entry.

The advantages of intravenous therapy are numerous. It is most scientific, and its accuracy results in immediate and certain action. It implies the direct injection into the blood-stream of a definite amount of material. If the exact action of the material is known, there is little question of what it will do. The blood-stream is one of the most resistant tissues of the body. It nourishes the body cells. Its leucocytes combat organisms

*Presented at the sixty-ninth annual meeting of the American Veterinary Medical Association, Atlanta, Ga., August 23-26, 1932.

that invade it. It carries immune bodies against many infections. It removes toxins and is the means of transporting hormones, glandular extracts, nutrition, etc., to all the tissues of the body. Altering the blood-stream by the use of drugs causes marked changes in the body functions.

A few worthy practical examples of the newer form of medication with its successful results are as follows:

1. The treatment of eclampsia in bitches with a solution of calcium chlorid or gluconate, using from 5 to 10 cc of a 20 per cent calcium chlorid solution for a dog weighing 20 to 40 pounds. The gluconate is safer to use, as a faulty injection of the chlorid will cause sloughing. The addition of magnesium chlorid tends to temper the action of the calcium salt on the heart.

2. Colloidal iron and arsenic solution, each 5 cc containing one grain of iron cacodylate, has been demonstrated to change the quantity and the quality of the red blood cells, increasing their activity and oxidizing power. In the treatment of secondary anemias this injection is followed by a general clinical improvement. Iron in crystalline salt form, such as the chlorid or sulfate, should not be used. It *must* be in the colloidal form.

3. For prolonged anesthesia the use of nembutal, administered by vein, results in immediate action.

4. In the treatment of septicemias the intravenous injection of the antiseptic dyes acri-, pro- or trypa-flavine, trypan blue, etc., results in their distribution to every part of the body almost instantaneously and produces a worthwhile action.

5. Sodium iodid solutions, 20 cc containing two grams (31 grains) of the drug, stimulate living protoplasm and promote lysis of dead and dying cells. This has a special action on eczema and arthritis.

6. Guaiacol and iodin, using 3 grains of pure guaiacol and ¾ grain of iodin in 20 cc of solution, gave us as excellent results in the handling of pneumonia cases in dogs as it is doing in human patients.

7. Ten cc of a solution containing 15 grains of sodium thiosulfate U. S. P., given intravenously, is our best method of combatting arsenic, mercury and other metallic poisonings.

I might add to this list, but intravenous therapy is neither new nor untried nor imperfectly demonstrated. It is steadily growing in favor and employment. Drugs placed directly into the blood-stream are not altered or diminished in action or af-

fected by digestion or metabolic modification after absorption from the stomach or the intestinal tract.

One word of caution: Intravenous solutions must be compatible with the blood. They need not be isotonic. Such products carefully prepared are safe and certain. A number of laboratories manufacture the needed solutions. The veterinarian only can give the treatment.

DISCUSSION

DR. C. W. BOWER: How frequently do you give the sodium iodid solution?

DR. FRICK: Two or three injections; one injection every other day. It depends upon the case. One preparation we have used a great deal is arsenic, iron and phosphorus. Take a hookworm case, or an operation, or anything in which you want tonic action, when the solution is given intravenously—we give it every day for three or four days with no harm at all—there is a great deal of improvement in the red blood count and in the general toning up of the body. As far as the technic of the intravenous injection is concerned, it is a matter of practice.

DR. J. A. CAMPBELL: Tell us something about the use of intravenous injections of camphor.

DR. FRICK: I do not know of a good camphor preparation which can be given intravenously.

DR. J. E. CRAWFORD: What has been your experience in giving distemper serum by intravenous injection?

DR. FRICK: We have done it, but we find that distemper is a long lasting disease—too long sometimes, so I do not see any particular advantage in giving the solution intravenously, unless a dog comes in exposed to infection. A difference of an hour or two is not much; so we do not give it intravenously. We have given some intravenously, particularly in some blood transfusions, but I see no reason for giving it intravenously when it is so much easier to give subcutaneously.

DR. C. F. SCHLOTTHAUER: I have seen doctors give alcohol intravenously, until they were apparently intoxicated, without any noticeable harm. They inject almost everything at the laboratory.

DR. J. L. RUBLE: I have been using a human preparation which is given intravenously. It contains fifteen per cent alcohol, as well as liver extract and blood hemoglobin, with copper and iron. I have been giving it in black tongue and have had excellent results.

DR. J. V. LACROIX: I wish to compliment the gentleman on the paper. It is stimulative, quite all right, but as he has indicated, cautioning against the needless use of the intravenous route is essential. He made reference to secondary anemias in dogs. I should be interested in knowing to what he referred and how they are recognized. I am also interested in what has been said concerning the use of nembutal as an antidote and its hypnotic and anesthetic effects. It seems to me that in practice, where nembutal is to be used for pre-anesthetic purposes, it is safer to employ a dose of morphin, followed an hour later by a small dose of morphin, and an hour later by nembutal. It may be given intravenously. I agree with Dr. Frick completely in that it is used to some extent. In the character of the effect to be produced the intravenous use of pentobarbital is, I think, quite generally satisfactory. The technician knows how to use it. The most important thing concerning the use of pentobarbital intravenously, if it is to be employed for complete narcosis, is to make a slow delivery. There is no occasion for measuring the dose, if you have had experience, except to conserve a drug that costs money. Rather I should say an indefi-

nite quantity of pentobarbital, given as usual, if the solution is used in the manner in which we are accustomed to use it, may be delivered without the knowledge of the dose except watching the effect as delivered, and that is done safely. I think you will find that true.

DR. FRICK: I agree with Dr. Lacroix. I want to clear up the subject. I did not go into the detail that you must have a sterile needle and a sterile syringe and a sterile solution, etc. Sometimes we shave the skin. I also forgot to mention the fact that all of these solutions must be given carefully and slowly. You can kill an animal in a hurry by the rapid injection of many drugs that will benefit that animal if given slowly. Shock with the serious effect to the circulatory system will throw an animal into convulsions. That also applies to intraspinal injections. As to what is secondary anemia, I would classify secondary anemia as the after-effect of some primary condition, such as abscession in the body, which is depleting the blood-stream, extensive mange, severe distemper, those conditions in which we do not have a direct hemorrhage. In many of these anemias we have no idea as to what is the cause. We classify it as secondary anemia, and in treating anemia that is secondary, wherever a tonic is indicated, we use an intravenous solution of iron, arsenic, or some other simple remedy.

DR. LACROIX: How do you recognize it?

DR. FRICK: Usually by the anemic condition of the skin and the mucous membranes, and in a few instances we have been surprised to find a dog, that appeared perfectly o. k. and had normal mucous membranes, to have a very low blood count. We are not doing as much of the blood count tests as we should like to because we are short of man power, but once in a while we will find a case of seemingly bright, normal mucous membrane with a low blood count. Where we have been used to giving triple arsenates, we now give iron arsenate intravenously.

DR. LACROIX: I wanted him to be specific, and for my information I asked about the secondary anemias. There is some confusion in the terminology regarding anemias, and I simply wished to have cleared up, in a measure, what was intended. Regarding the manner of diagnosis, I wish to be understood in that also. Ten years ago, practitioners, who were treating small animals, were not commonly making microscopic examinations to determine the nature of intestinal worm parasites. They were guessing at anemias, and I for one did and do a lot of guessing, entirely too much of it. I have been surprised in some tests that have followed my guessing. I think that within a very brief period we will know something about anemias in dogs that comparatively few men are familiar with now.

The Beshers Plan

Congress has been asked to enact a law that will require that all petroleum products used as fuel in internal combustion engines be blended ten per cent by volume with ethyl alcohol made from agricultural products grown within the continental United States. This so-called "Beshers Plan" is predicated on the fact that agriculture is an industry of vital importance to our economic order. Dr. J. A. Owens (McK. '18), of El Paso, Ill., vice-president of the Illinois State Veterinary Medical Association, has been boosting the Beshers Plan very actively in his territory.

SOME LESSONS OF PEACE*

By N. S. MAYO, *Highland Park, Ill.*

It has been said that "peace has her victories as well as war," and peace has her lessons as well as war. As a people we are inclined to be impetuous, attacking problems vigorously, if not always judiciously, and after the crisis has passed we have a tendency to relapse into a state of "innocuous desuetude" until another crisis appears, without having made the needed preparations to meet it. This is well illustrated by the decline in numbers of reserve officers available for service in a national emergency. The plans of the War Department are ample and the Surgeon General's office has put these plans into effect, but the peace-time apathy of our profession is evident in the marked decrease in the number of reserve officers that fulfill the requirements.

There are, of course, other reasons than the general American characteristic previously mentioned. The average practitioner is so occupied in his necessary daily professional work, earning his living, and particularly during the past two years, that it is difficult to carry on other work that does not contribute directly to his daily bread. Another reason is the relative isolation of the average veterinarian. Many are located in comparatively small towns, and their number is relatively small when compared with the practitioners of human medicine. If funds were available it would seem that a desirable contact would be to make the *Veterinary Bulletin* of the Surgeon General's office available to every veterinary reserve officer. This is an excellent journal and is of great value in keeping veterinary officers interested in and posted on the problems of veterinary officers.

I have always been interested in the American army veterinary service and have known the service well for more than forty years. During the past few years, I have visited more than a dozen army posts in this country where veterinary officers are stationed, and two foreign posts, and I wish to state that the personnel of the Veterinary Corps of the United States Army is the best in its history. The veterinary officers are well qualified and, I believe, will compare favorably with any army veterinary service in the world. The organization of our veterinary service should in time be changed to make it more independent and responsible, but I do not think radical changes should be made at the present time.

*Presented at the sixty-ninth annual meeting of the American Veterinary Medical Association, Atlanta, Ga., August 23-26, 1932.

In recent years there has been a noted development of mechanical transport for military purposes. This indicates a reduction of animal transport and possibly of veterinary personnel in future wars. Animal suffering and loss in war has always been great and if this can be reduced without a sacrifice of human lives it will be a benefit. Whatever the outcome of this mooted problem, it is our duty to make available the most effective veterinary service possible.

Animal wastage in war is due largely to debility resulting from severe work, from lack of proper food and care, and to exposure. With the great increase of motor power generally, the number of young men familiar with the care and handling of horses has greatly diminished so that in the future it will be necessary to provide special training in this important work.

In a future national emergency, when it will be necessary to mobilize the armed forces of the country, the burden and responsibility for the veterinary service will rest largely upon the young men. Most of the veterinary officers who served in the World War will not be available because of age or other reasons. Wars are carried on as a rule by relatively young men and it is important that those who are now students in the veterinary colleges should be posted upon their duty to their country as citizens, and their responsibility as officers in case of war. All of the eleven veterinary colleges in the United States are now units of state universities or colleges, and four have veterinary officers detailed by the War Department to give courses in Military Veterinary Service. It is from these colleges that most of the replacements for the Veterinary Corps are selected by competitive examination. It would appear desirable for all of the veterinary colleges to have at least a few lectures annually on Army Veterinary Service. Such lectures might be given by some veterinary officer in the corps area at small expense and it is probable that in most instances the college itself would provide for the necessary expense.

Every veterinarian should recognize clearly that in a national emergency his services are due the Republic. The people have decided that the military policy of this country shall provide a small standing army in time of peace and a citizens' army in an emergency. We now have in effect a plan for a citizens' army that provides for limited peace-time training. This plan, to attain satisfactory results, depends upon the voluntary coöperation of citizens in time of peace, and required service in time of war. It is our duty as citizens and veterinarians to give this our

active and wholehearted support. Many citizens do not have a proper conception of their relations to the government. If the government requires them in military service, that is something *they owe to the government*, and the only debt the government owes them is to provide for them in case of disability in government service.

I have offered some suggestions on "Some Lessons of Peace." Peace is only a relative term, and generally refers to that condition of the struggle of society not marked by the force of arms. Pacifists may shout peace, preachers may preach peace, poets may sing to us of quiet woods and peaceful valleys, but the scientist will tell you that every living thing, every blade of grass in that peaceful valley is engaged in a desperate struggle for its existence, not with its neighbor for nourishment and light, but against its insect and other enemies. It is part of that eternal struggle for existence of all living things. Peace? There is no peace save the peace of death.

At the present time the tumult of war is brought to us daily from various parts of the world. Nation is fighting nation with tariffs, embargoes and boycotts. The direct loss of human life may be small but when the fight reaches the stage where the life of a nation is threatened there will be real war. No sane person wants war, but if the people of the United States declare war we must do all we can to reduce its horrors to a minimum. That great military leader and statesman, General Washington, said, and he spoke from years of bitter experience, "In time of peace prepare for war."

Golden Wedding Anniversary

Dr. and Mrs. Walter Shaw, of Dayton, Ohio, celebrated their golden wedding anniversary on April 11, 1933. Dr. Shaw was graduated from the Ontario Veterinary College in 1881 and has been in active practice in Dayton since 1886, when he moved there from London, Ontario. He was a member of the Board of Examiners of the Ontario Veterinary College for 25 years and a member of the Ohio State Board of Veterinary Medical Examiners for 15 years. He served the Ontario Veterinary Association as president and held the same office in the Ohio State Veterinary Medical Association for two years (1898-1900).

Come to Chicago—August 14-15-16-17-18

ANAPLASMOSIS

I. Its Occurrence in Louisiana*

By G. DIKMANS, *Washington, D. C.*
Zoölogical Division, Bureau of Animal Industry
U. S. Department of Agriculture

According to Giltner,[1] anaplasmosis was reported from Louisiana first by Dr. E. P. Flower, in 1924, from Orleans Parish. Dr. F. J. Douglass, of New Orleans, Louisiana, states that the first cases of anaplasmosis occurred in his practice in 1923.

The writer's first actual experience with the disease, although unrecognized at the time, through lack of facilities for blood examination, was in the fall of 1926. Five animals in the dairy herd at the Iberia Livestock Experiment Farm became sick. The clinical symptoms were those of depression, high fever, rapid, labored respiration, rapid pulse, pallor of the visible mucous membranes, atony of the rumen, and constipation. Of the five sick animals, four died. Postmortem examination showed a thin, watery blood, greatly enlarged yellow liver, gall-bladder distended with a thick, viscid, "coffee-grounds" bile, and an enlarged spleen. No hematuria or hemoglobinuria. No definite diagnosis was established at the time. In view of later developments and better acquaintance with anaplasmosis, the writer now is convinced that he was dealing with that disease and did not recognize it. Two mild cases of anaplasmosis were encountered in the same herd in 1927 and one in 1928. In 1928, also, there were, in the beef herd maintained at this station, three definitely diagnosed cases, including one mild case and one severe case, both followed by recovery, and one case resulting in death on pasture.

In 1927, several animals in the beef herd maintained by the Louisiana State University, at Baton Rouge, became sick. These cases were diagnosed as hemorrhagic septicemia at first, but a later examination of stained blood-films established a diagnosis of anaplasmosis. In the fall of the same year, the Louisiana State Live Stock Sanitary Board submitted to us for examination some blood-smears taken from a herd in Tensas Parish. A diagnosis of anaplasmosis had been made on the basis of the clinical symptoms and postmortem pathology. The diagnosis was confirmed by blood-smear.

In November, 1928, the writer was asked to examine two animals in Saint Mary Parish. The diagnosis on the basis of clini-

*Received for publication, April 8, 1932.

cal symptoms and stained blood-smears was anaplasmosis. One animal recovered and one died.

This gives us five definite localities in the State where the disease is known to occur, and all of these localities are tick-free, *i. e.*, free from the cattle tick, *Boöphilus annulatus*, the recognized carrier of tick fever and the tacitly accepted carrier of anaplasmosis in tick-infested areas. Orleans Parish was declared tick-free in 1917, Tensas Parish in 1914, East Baton Rouge Parish in 1918, and Saint Mary Parish in 1919. Iberia Livestock Experiment Farm has been tick-free since 1916.

To these cases must be added one case occurring on April 27, 1929, at Lake Charles, Calcasieu Parish, a case definitely diagnosed as anaplasmosis on the basis of clinical symptoms, postmortem pathology, and appearance of stained blood-films. Calcasieu Parish is still within the tick-quarantine area, and until 1929 this was the only definitely diagnosed case of anaplasmosis in the ticky area in Louisiana. It is highly probable that anaplasmosis is far more widespread in Louisiana than these instances indicate.

REFERENCE

[1]Giltner, L. T.: Anaplasmosis of cattle in the United States. Jour. A. V. M. A., lxxii (1928), n. s. 25 (6), pp. 919-932.

Look This Up When You Come to Chicago

Persons in Chicago for the World's Fair will find in the Chicago Classified Telephone Directory, indexed and readily available, abundant information about the Century of Progress Exposition itself and about the city in general, including a map of the Exposition Grounds, information about nearby parking spaces, an automobile road map of Chicago and vicinity, a map of the Chicago Surface Lines System and of the Elevated Lines, and a list of points of general interest in the city.

Telephones and Veterinarians

Telephone companies have been giving practicing veterinarians some nice publicity, through the medium of advertisements in various farm papers. Two such advertisements have been brought to our attention, one in the March issue of *The Cattleman* (Fort Worth, Tex.), and the other in *Wallace's Farmer and Iowa Homestead* (Des Moines, Iowa). Both direct attention to the value of the telephone in obtaining prompt veterinary service.

ANAPLASMOSIS

II. A Short Review and a Preliminary Demonstration of Its Identity in Louisiana*

By G. DIKMANS, *Washington, D. C.*

Zoölogical Division, Bureau of Animal Industry
U. S. Department of Agriculture

Smith and Kilborne,[2] in their paper describing Texas fever, mentioned the occurrence of coccus-like bodies, which they considered as a phase in the life-history of *Piroplasma bigeminum* and the cause of a mild type of Texas fever.

Theiler[3] found similar bodies in the blood of South African cattle suffering from "red water," and by means of inoculation experiments demonstrated that the "marginal points" were not a phase in the life history of *P. bigeminum* as supposed by Smith and Kilborne. He considered these "points" as endoglobular protozoan parasites, *sui generis*, and proposed the name *Anaplasma marginale* for them. In part IV of the same paper he states that *A. marginale* is transmitted by the same tick that in South Africa transmits *P. bigeminum*, *viz.*, *Boöphilus decoloratus (= Margaropus decoloratus)*.

In a second paper, Theiler[4] cites some experiments in further proof of his argument that *A. marginale* is transmitted by *M. decoloratus*, and in one experiment showed that *Rhipicephalus simus* also could act as a carrier.

An interesting fact to be noted in connection with the anaplasma infection described by Theiler[3] is that the animals which acquired the infection in Transvaal, by inoculation with blood of a Transvaal animal, had been inoculated previously in England with a strain of piroplasmosis originally sent to England in ticks from South Africa. As far as the writer has been able to learn, none of the animals inoculated with the blood of the animal which contracted piroplasmosis, as a result of the infestation with ticks sent from South Africa, suffered from anaplasmosis in England.

This is interesting in view of the fact that Theiler shows, in part IV of this same paper, that ticks of the same genus and species as those sent to England, *viz.*, *Boöphilus annulatus*, transmitted anaplasmosis in South Africa, and his further statement that "nearly all Transvaal animals are infected with both parasites." Therefore, either the ticks sent to England from South

*Received for publication, April 8, 1932.

Africa were not carriers of anaplasmosis or if they were carriers they did not transmit the disease.

In view of the findings of Rosenbusch and Gonzalez[5] that, in Argentina, *Boöphilus micoplus* transmits this disease only when the outside temperature is high (above 30° C. = 93.2° F.) we might be inclined to ascribe the failure of these ticks to transmit anaplasmosis in England to meteorological conditions, if we did not have at the same time a record of Theiler's experiments. Theiler's successful tick-transmission experiments were performed in what in our latitude would correspond to the fall and winter season, although the ticks may have engorged during the summer. The only conclusion we can draw, therefore, is that the particular ticks sent from South Africa and which transmitted piroplasmosis to the animals on which they were placed, were not carriers of anaplasmosis. Wenyon[6] states that neither Lignières[7, 8, 9] nor Brumpt[10] was able to confirm Theiler's observations as regards the transmission of anaplasmosis by ticks. In the same paper Theiler also reports cases of pure anaplasmosis, *i. e.*, cases of anaplasmosis unassociated with piroplasmosis.

From 1910 to 1920, inclusive, anaplasmosis was reported from practically the entire African continent and from many other parts of the world by various authors. The most outstanding contribution came from Lignières, in South America, who showed that sheep and goats could act as carriers of the disease without themselves being affected in any manner. He demonstrated that the Argentinian strain of Anaplasma could be transmitted through a number of sheep in series.

Sergent and his coworkers[11, 12] confirmed Lignières' work in part. These authors state that they were able to obtain passage through sheep, but not through goats. They also report that they were unable to pass the virus through sheep in series and that sheep's blood did not remain infective for over a period of six months. From their cross-immunization experiments they concluded that the Algerian anaplasmosis and Argentinian anaplasmosis were identical. They make no mention of a carrier.

In the United States, Anaplasma, although unrecognized as such at the time, was undoubtedly first observed by Smith and Kilborne, but, except for Meyer's[13] account, anaplasmosis as a distinct disease seems to have received no attention in the United States until a few years ago. As stated by Giltner,[1] Flower, in 1924, called the attention of the Bureau to a disease of cattle near New Orleans, which he considered to be anaplasmosis. Darlington,[14] in 1926, reported it from Kansas; Boynton,[15] in 1927,

from California; Giltner,[1] in 1928, from Florida, and Stiles,[16] in 1929, from Oklahoma and Nevada. Two outbreaks are reported from Nevada; one was in a herd of cattle brought into the State from California, and the second, occurring in the winter, was due to mechanical transmission in dehorning (Hilts[17]).

Descazeaux[18] reported anaplasmosis from Chile, in a region where no piroplasmosis was found and where no ticks were found on animals suffering from anaplasmosis. We have a published report from Uruguay to the same effect.

The areas in the United States from which anaplasmosis has been reported since 1924, with the exception of our one case in Calcasieu Parish, La., have been tick-free areas, *i. e.*, areas free from *Boöphilus annulatus*. Therefore, we have anaplasmosis associated with piroplasmosis in ticky territory; pure anaplasmosis in ticky territory; and pure anaplasmosis in tick-free territory, *i. e.*, territory free from *Boöphilus annulatus*.

The reports of actual cases of anaplasmosis associated with piroplasmosis in the presence of some species of Boöphilus, the recognized carrier of piroplasmosis, far outnumber the reports of pure anaplasmosis either in the presence or absence of this insect and it has been the general opinion that the two diseases are concurrent or consecutive in an animal and are transmitted by the same vector. De Asua and coworkers[19] have even expressed the opinion that under natural conditions, *i. e.*, in the field, anaplasmosis follows piroplasmosis and perhaps can occur only when an animal has suffered from a previous attack of piroplasmosis, or, as they put it, "dass in der Natur die Anaplasmose nur einer Piroplasmose folgt und sich vielleicht nur dann entwickeln kann wenn der Organismus durch diese vorbereitet ist."

The American reports of anaplasmosis unassociated with piroplasmosis in areas officially declared tick-free, *i. e.*, free from *Boöphilus annulatus*, the recognized carrier of piroplasmosis, have been received with skepticism. Under these conditions it was only natural that various theories concerning the disease, its etiology, its spread, etc., would be held by those dealing with the trouble in the field. Some of these theories were: (a) That the disease occurred only in heavily fed, mature, dairy cattle; (b) that the disease could not be transmitted by blood inoculation; and (c) that the disease was hemorrhagic septicemia.

The first theory was based upon the fact that the locality where it was first noticed in Louisiana was Orleans Parish. The disease occurred chiefly in the dairy herds supplying the city of New Orleans with milk. In the immediate vicinity of New Or-

leans few herds of range cattle are found. The dairy herds are recruited by importing animals from other parts of the country, *viz.*, Wisconsin, Illinois and other states. Very few dairymen attempt to raise calves to maturity. The immediate result of this practice is that a constant supply of susceptible animals is kept at hand, with constant possibility of yearly recurring outbreaks.

The second theory was based largely upon a total absence of experiments either to prove or disprove the point raised, upon the alleged impossibility of transmitting from animal to animal by blood inoculation a similar disease occurring in Cuba, and upon the failure of Dr. H. W. Schoening to transmit the disease in that manner in one experiment which is mentioned in Giltner's paper.

The third theory, *viz.*, that this disease is hemorrhagic septicemia, appears to be based upon the finding of petechial and ecchymotic hemorrhages on the surface of the heart and aorta on postmortem examination, and on failures to take into consideration the possibility that the disease was anaplasmosis and to check this possibility adequately.

Our preliminary experiments were planned to obtain some information on these three points. As there was at that time no place available for such work at our official station, Jeanerette, La., Dr. Flower, secretary of the Louisiana State Live Stock Sanitary Board, agreed to furnish the animals for the first experiment and to provide a place where the experimental work could be performed. As experiment animals two yearling range heifers were selected. These animals had been born and raised on pasture and had never been grain-fed. They were placed in a stall at the old serum plant in Baton Rouge, La., a place well suited to the work because it was isolated from areas on which there were cattle. Only one animal, a family cow, was kept within several miles of the place. These animals were injected with blood obtained by Dr. C. M. Heflin, from a case of "yellow jaundice" or anaplasmosis, occurring in the practice of Dr. Douglass, in New Orleans.

The injection was made intravenously by Dr. Heflin on the evening of October 15, 1927, and the reaction occurred on November 8 in one case, hereafter designated as cow 1, and on November 9 in the other, cow 2, after incubation periods of 23 and 24 days. The amount of blood used was about 7 cc. Cow 2 died of the disease, the other recovered. The result showed plainly that animals other than dairy cows on full feed could contract the disease.

Four additional animals were now purchased in order to make some closer observations. These cows were given ear-tag numbers 31330, 31331, 31332 and 31333. Cow 31330 was placed in the stall with cow 1, on November 15, 1927, in order to find out whether the mosquitoes, biting flies, etc., that swarmed in the stall, could transmit the disease. This was admittedly a "trial balloon" sent up to determine the direction of the wind and can hardly be classified as a scientific experiment. The animal remained absolutely normal until December 27, 1927, a period of 42 days. Cow 31331 was injected with serum from cow 1 and cow 31332 received blood from the same source. Neither animal showed any reaction during a period of observation lasting 59 days. They were probably immune. Cow 31333 was injected on November 16, 1927, with 10 cc of blood from a Hereford bull suffering from anaplasmosis and belonging to Louisiana State University. The cases occurring in this herd had been diagnosed as hemorrhagic septicemia. The sick animals had been treated with anti-hemorrhagic septicemia serum and the remainder with hemorrhagic septicemia aggressin. In spite of this treatment other animals in the Univ rsity herd became sick with typical clinical symptoms of anaplasmosis. Cow 31333 showed a reaction on December 22, after an incubation period of 36 days. The animal recovered.

As our first cases had reacted in 23 and 24 days, respectively, following an injection of 7 cc of blood, it appeared to us on December 19, 1927, 33 days after the last animal had been inoculated, that we would be unsuccessful in our second attempt to transmit the disease by blood inoculation. Accordingly we decided to make a third attempt. For this purpose two more animals were purchased and as donors cow 1 (our first successful transmission case) and a Hereford cow from the beef herd at Louisiana State University, which had suffered from an attack of anaplasmosis in October, 1927, were selected. The animals bought for the purpose of the experiment were numbered 7 and 8. Cow 7 was injected on December 19, 1927, with 30 cc of blood from the Hereford cow mentioned above. On January 3, 1927, *i. e.*, 15 days after inoculation, the temperature rose to 104.2° F. On January 4, the temperature dropped to 101.6° F. On January 5, the temperature rose to 103.4° F. in the morning and 104.4° F. in the afternoon. Anaplasma was found in the blood on January 7. Cow 8 was inoculated on December 20, 1927, with 30 cc of blood from cow 1. On January 3, *i. e.*, 14 days after inoculation, the temperature rose to 104.4° F. Blood-smears showed

Anaplasma. In the meantime cow 31330 had remained in the stall with cow 1 since November 15, a period of 42 days, exposed to such flies and mosquitoes as were present in the stall. The official weather temperature recorded for the period from November 15 to December 27, 1927, varied from a maximum of 50° F. on November 17, 1927, to a maximum of 82° F. on November 29, 1927, and from a minimum of 35° F. on November 16 to a minimum of 62° F. on November 24, 1927. The temperature in the building where the animals were stabled was undoubtedly higher. There were plenty of flies and mosquitoes. The temperature of this animal taken during the entire 42 days showed no increase. Cow 31333 reacted on December 22, 1927. As the writer was unable to be in Baton Rouge at that time, he requested that cow 31330 be inoculated with blood from cow 31333, in order to determine whether or not the failure of the tentative experiment of exposing the animal to insect bites in the company of a carrier was due to lack of susceptibility. This was done on December 27, 1927. The first rise of temperature was noticed on January 17, 1928, after an incubation period of 21 days. The animal died on January 24, 1928, from anaplasmosis. The animal, therefore, was susceptible to the disease and the insects present in the stall had not transmitted the disease during the period of 42 days.

The successful inoculation of six animals out of eight definitely disposes of the second argument, *viz.*, that the disease, anaplasmosis, could not be transmitted by blood inoculation. The lack of success, in cases attributed, on the basis of later results, to immunity resulting from previous infection, served the useful

TABLE I—*Summary of first eight experimental cases.*

ANIMAL	DATE OF INJECTION	AMOUNT INJECTED* (CC)	DATE OF REACTION	INCUBATION PERIOD (DAYS)	RESULT
1	10–15–27	7	11– 8–27	24	Recovered
2	10–15–27	7	11– 9–27	25	Died, 11–12–27
31331	11–18–27	10			No reaction
31332	11–16–27	10			No reaction
31333	11–16–27	10	11–22–27	36	Recovered
7	12–20–27	30	1– 3–28	14	Recovered
8	12–20–27	30	1– 3–28	14	Killed for tissue
31330	12–27–27	25	1–17–28	21	Died

*All injections made intravenously.

purpose of calling our attention to the necessity of purchasing test animals from areas in which the disease is not prevalent.

There remained the third argument to be disposed of, *viz.*, that this disease was hemorrhagic septicemia. As stated before, this diagnosis appeared to be based upon the finding of petechial and ecchymotic hemorrhages on the surface of the heart on postmortem examination. White[20], describing the necropsy findings in hemorrhagic septicemia, mentions two points by which the two diseases can be distinguished. He states that in hemorrhagic septicemia the spleen is not enlarged, and that the blood is apparently normal. In anaplasmosis, the spleen is definitely enlarged. The degree of enlargement varies, but increase in size, generally in all measurements, but most assuredly in thickness, has been found to be present in all cases examined postmortem.

A much more striking feature, noticeable both as a clinical symptom and as a postmortem finding, is the presence of changes in the blood. In most cases of anaplasmosis and especially in those cases coming to necropsy, the alteration in the blood is very pronounced. These changes are noticeable without recourse to laboratory methods of examination. The methods employed in the laboratory merely confirm the clinical findings.

Another marked difference is the period of incubation. In the series of cases recorded in the foregoing pages, the period of incubation in anaplasmosis varied from 14 to 36 days. According to Sergent, the period of incubation varies with the amount of blood used for inoculation. In the cases so far cited we had incubation periods of 23 and 24 days following inoculation with 7 cc of blood, of 36 days with 10 cc of blood and of 14 and 15 days with 30 cc of blood. These cases are not sufficient upon which to base an opinion on this point.

In hemorrhagic septicemia, according to White, "the period of incubation is short, usually one to two days." It is hardly to be expected that in inoculating a susceptible animal with virulent hemorrhagic septicemia blood one would have to wait three weeks for the development of symptoms.

However, probably the most convincing argument is presented by the inoculation of laboratory animals, *viz.*, guinea pig and rabbit. Both of these animals are susceptible to hemorrhagic septicemia and neither is susceptible to anaplasmosis. Through the courtesy of Dr. Harry Morris, of Louisiana State University, we were able to inoculate both rabbits and guinea pigs with blood taken from case 31330. This blood was taken aseptically on the day before this animal died, and, therefore, at a time when the

etiological agent of anaplasmosis was undoubtedly present in the circulation. The rabbits were inoculated intravenously and the guinea pigs intraperitoneally and subcutaneously. The animals were observed daily during a period of 30 days. No signs of illness were noted. Therefore, on the basis of clinical symptoms, postmortem pathology, blood findings, and animal inoculation, we are justified in stating that the disease in the University of Louisiana beef herd, diagnosed and treated as hemorrhagic septicemia, was not this disease but was anaplasmosis.

The work recorded in the preceding pages demonstrated: (a) that cattle, other than full-fed dairy cattle, are susceptible to the disease; (b) that the disease can be transmitted by blood inoculation; and (c) that the disease is not hemorrhagic septicemia.

REFERENCES

[3]Smith, Th., and Kilborne, F. L.: Investigations into the nature, causation and prevention of Texas or southern cattle fever. 8th & 9th Ann. Rpts., B. A. I., U. S. Dept. of Agr., for 1891-1892 (1893), pp. 177-304.

[4]Theiler, A.: *Anaplasma marginale* (Gen. and Spec. Nov.). The marginal points in the blood of cattle suffering from a specific disease. Rpt. Gov. Vet. Bacteriologist, Dept. of Agr., Transvaal, S. Africa, 1908-1909 (1910), pp. 7-64.

[4]Idem: Further investigations into anaplasmosis of South African cattle. Rpt. Director Vet. Res., Dept. of Agr., Pretoria, S. Africa (1911), pp. 7-46.

[5]Rosenbusch, F., and Gonzalez, R.: Beitrag zum Studium der Tristeza. Arch. f. Protistkd., l (1925), 3, pp. 443-485.

[6]Wenyon, C. M.: Protozoölogy. A manual for medical men, veterinarians and zoölogists. (Baillière, Tindall & Cox, London, 1926), 2 vols.

[7]Lignières, J.: Piroplasmes, anaplasmes et grains chromatiques. Bul. Soc. Path. Exot., xii (1919), 8, pp. 558-566.

[8]Idem: Contribution a l'étude de l'anaplasmose bovine. Bul. Soc. Path. Exot., xii (1919), 9, pp. 641-651.

[9]Idem: La vaccination des bovidés contre l'anaplasmose. Bul. Soc. Path. Exot., xii (1919), 10, pp. 765-775.

[10]Brumpt, E.: Piroplasmoses des bovidés et leurs hôtes vecteurs. Bul. Soc. Path. Exot., xiii (1920), 6, pp. 416-460.

[11]Sergent, E., et al: Les piroplasmoses bovines d'Algerie. Arch. de l'Inst. Past. d'Algerie, ii (1924), I, pp. 1-146.

[12]Idem: Les piroplasmoses bovines d'Algerie. Deuxième mémoire. Arch. de l'Inst. Past. d'Algerie, v (1927), 3, pp. 245-468.

[13]Meyer, K. F.: Die anaplasmose der rinder. Cited by Kolle & Wassermann: Handbuch der Pathogenen Mikroorganismen, viii (1927), 5, p. 83.

[14]Darlington, P. B.: Anaplasmosis in cattle (Gal ziekte) found to exist in Kansas. No. Amer. Vet., vii (1926), 7, pp. 39-41.

[15]Boynton, W. H.: Observations on *Anaplasma marginale* in cattle of California. Corn. Vet., xviii (1928), l, pp. 29-48.

[16]Stiles, G. W.: Investigations on anaplasmosis in cattle. Jour. A. V. M. A., lxxiv (1929), n.s. 27 (5), pp. 704-723.

[17]Hilts, W. H.: Anaplasmosis following dehorning. Corn. Vet., xviii (1928), 4, pp. 330-332.

[18]Descazeaux, J.: L. anaplasmose en Chili. Bul. Soc. Path. Exot., xvii (1924), 8, pp. 639-642.

[19]de Asúa, F. J., Dios, R. L., Zuccarini, J. A., and Kuhn, M. J.: Studien zur Tristezafrage. Beihefte zum Arch. f. Schiffs- und Tropen-Hyg., xxxi (1927), 5, pp. 1-34.

[20]White, D. S.: A Textbook of the Principles and Practice of Veterinary Medicine. (Lea & Febiger, Philadelphia & New York, 1920.)

In 1908, meat consumption in the United States was 154.9 pounds per capita. By 1930, it had fallen off to 131.7 pounds. This is a decrease of 23.2 pounds, or more than a pound a year.

THE RAPID SPREAD OF BANG'S DISEASE IN AN ACCREDITED HERD*

By FRANK THORP, JR., *and* ROBERT GRAHAM
Laboratory of Animal Pathology and Hygiene
University of Illinois, Urbana, Ill.

The accreditation of Illinois dairy and beef cattle herds free from Bang's disease, by the Chief Veterinarian of the State Department of Agriculture, has presented the problem of maintaining State-accredited herds free from brucelliasis. In Illinois this task is the responsibility of the local accredited veterinarians and herd-owners. To protect accredited herds against the introduction of infection, new additions to herds are restricted to animals from accredited herds, or unbred heifers from non-accredited herds have been added to accredited herds through a plan of temporary quarantine and repeated testing. Assurance of freedom from Bang's disease in accredited herds, as in federal tuberculosis-free accredited herds, is based upon annual negative tests.

The effectiveness of simple quarantine measures in Bang's disease suppression has been noted in the control of the disease on different farms. In many Illinois herds, temporary isolation of reacting animals has prevented the spread of the disease for periods of two to four years. Notwithstanding the effectiveness of quarantine in the control and suppression of Bang's disease, it must be acknowledged that under certain conditions the disease spreads very rapidly. The purpose of this discussion is to call attention to the rapid spread of Bang's disease in an accredited herd and to remind practitioners engaged in Bang's disease control of the importance of preventive measures in maintaining herds free from the disease.

The accredited herd herein discussed, that ultimately became infected with Bang's disease, was developed from a small unit. During the summer, the animals had access to pasture and were stabled twice a day for milking. In the winter period the herd was confined to the barn. A study of the herd history (breeding records and agglutination test) indicated freedom from Bang's disease for at least three years (fig. 1). During this time all animals over six months of age had been tested annually for Bang's disease with negative results. Female breeding animals had not been added to the herd for a period of five years pre-

*Received for publication, July 8, 1932.

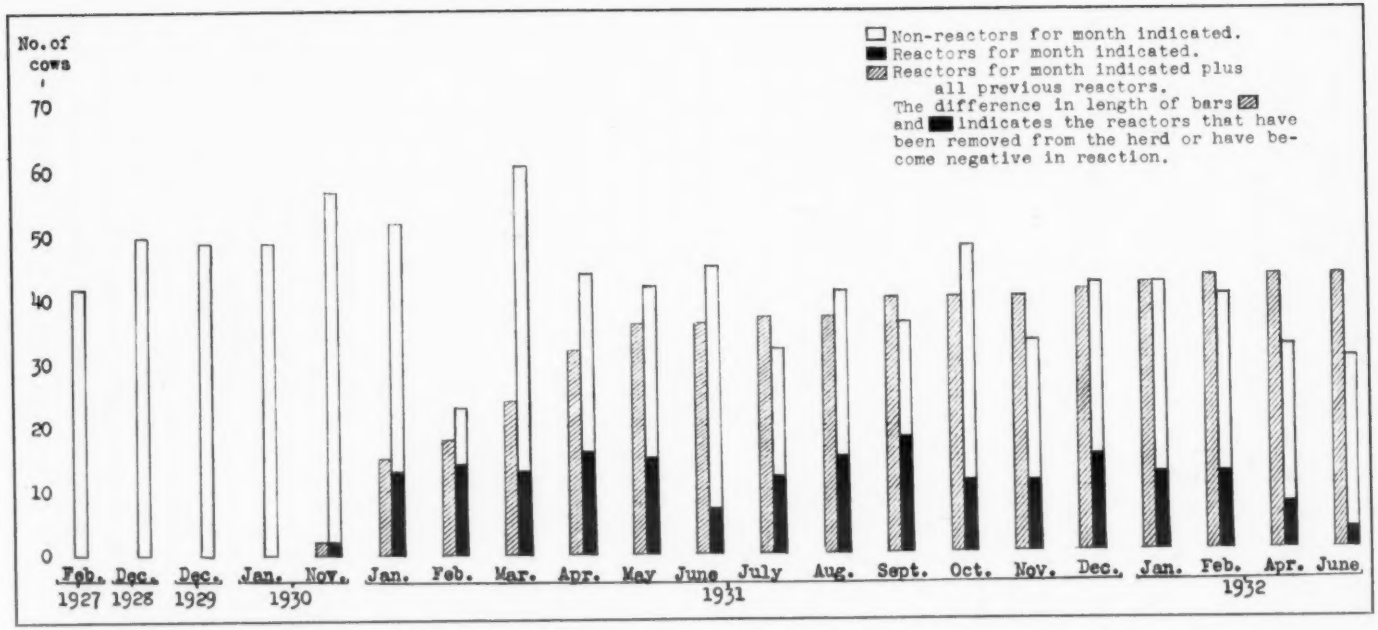
No. of cows
70
60
50
40
30
20
10
0
Non-reactors for month indicated.
Reactors for month indicated.
Reactors for month indicated plus all previous reactors.
The difference in length of bars and indicates the reactors that have been removed from the herd or have become negative in reaction.
Feb. Dec. Dec. Jan. Nov. Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Apr. June
1927 1928 1929 1930 1931 1932

FIG. 1. Chart showing destructive course of Brucella infection in a herd of dairy cattle over a period of two years.

ceding the appearance of the disease in November, 1930. Bulls for breeding purposes, however, were exchanged between this herd and another accredited herd.

One bull, used temporarily in this herd, gave inconsistent positive and suspicious reactions to Bang's disease. The explanation of the introduction of the disease *via* the bull, however, was not proven, inasmuch as Brucella strains were not isolated from this animal. Moreover, the first cow that reacted to the agglutination test for Bang's disease in this herd had never come in contact with this bull. Following the appearance and rapid spread of the disease in the herd, pigeons, hogs, horses and sheep on the farm were tested for Brucella agglutinins with negative results. Therefore, the source of the infection in the clean herd remains a matter of conjecture.

Over a period of three years (February, 1927, to January, 1930, inclusive), all the animals in this herd were negative, in serum-antigen dilutions of 1:50, 1:100 and 1:200, for Bang's disease.* In September, 1930, however, one cow aborted in pasture and a blood test on the animal was positive for Bang's disease.† This cow was removed from the premises immediately. Agglutination tests made on the entire herd, in November, 1930, showed two reacting and 55 non-reacting animals. One of the reactors was positive (1:200 agglutination) and was sold immediately. The other animal, a suspicious reactor (1:50 agglutination) was retained and was still in the herd in July, 1932.‡ This animal gave a negative test in January, 1931 but later became a positive, though inconsistent, reactor.

From November, 1930, to January, 1931, inclusive, 13 new reactors developed in the herd. Monthly tests conducted on the herd showed that 27 new reactors developed during 1931. The more rapid spread appeared during the first part of the year, 21 reactors developing between the January and May tests. The reactors were sold gradually. Agglutination tests in June 1932 detected only three positive reactors, all animals from the original herd, while no new reactors had developed since February, 1932. Two of these three reactors have been sold (July, 1932). The other reactor (one of the original reactors in November, 1930) has been retained for breeding purposes.

*Monthly tests were not conducted on all animals in the herd. Table I, therefore, shows the degree of infection in the animals tested at each period rather than the precise status of the herd infection.

†The positive reaction on this animal is not shown in table I, as the entire herd was not tested at this time.

‡Upon detection, reactors were placed in temporary quarantine and isolated from the herd during calving.

During the period from November, 1930, to June, 1932, 43 animals in an accredited dairy herd (97 animals tested) became reactors to Bang's disease. Approximately three-fifths (33 of the 55 negative animals in the original herd, tested in November, 1930) became reactors during this period. Eleven of the reactors aborted. Approximately 30 young males and females of breeding age from this herd, reared in temporary quarantine, constitute the non-reactors in the herd at the present time. It is the plan of the owner to eliminate all reactors and rebuild a clean herd with the offspring of reacting animals.

SUMMARY

Contrary to observations in some herds, Bang's disease spread very rapidly in the accredited herd herein discussed. Over a period of two years, approximately three-fifths of the non-reacting animals of breeding age in an accredited herd became positive to the agglutination test for Bang's disease. The total number of reactors developing during this period was equivalent to approximately 80 per cent of the original herd. The non-reacting unit, after two years, is approximately one-half the size of the herd when the disease first appeared.

It's the Principle of the Thing

A vivisection story told by Sir Frederick Hobday, Principal of the Royal Veterinary College, London, England, is related in a recent issue of *Veterinary Record:*

"I was looking at a show window containing horrible pictures and exhibits supposed to represent vivisection. A young lady came from the shop and invited me in."

She said, "You will come in and sign against these horrible cruelties?"

"Are they true?"

"Oh yes, 1,300 go on every week in the vivisection laboratories of the different hospitals. There is one college where it is done more than anywhere else. That is the Royal Veterinary College."

"Have you seen it done at the College?"

"No, but I know it goes on. Will you please come in and sign against it?"

"You must excuse me. I happen to be the Principal of that College."

"Just imagine, he always goes to sleep with his shoes on."

"Who does that?"

"My horse."

EXPERIMENTAL ERYSIPELOTHRITIC ARTHRITIS IN LAMBS*

By HADLEIGH MARSH, *Bozeman, Montana*
Montana Veterinary Research Laboratory

A chronic arthritis in lambs caused by infection with *Erysipelothrix rhusiopathiae* has been studied for several years in this laboratory. The disease has been produced by inoculation of the causative organism and by exposure of lambs to artificially infected premises. The reproduction of the characteristic symptoms and lesions by intravenous inoculation was reported briefly in a previous publication.[1] It is the purpose of this paper to report the results of more extensive experiments, with conclusions as to the natural portal of entry and methods of preventing the infection.

SEROLOGICAL DIAGNOSIS

The agglutination test has been used as an aid in field diagnosis and as a check on the results of inoculation experiments. The blood of naturally occurring cases of the disease was found to contain agglutinins for *E. rhusiopathiae*, and a large number of agglutination tests were made to determine the significance of this reaction.

The antigen used was made by growing the organism on serum-agar for 48 hours, washing off the growth in .85 per cent sodium chlorid solution containing 0.5 per cent phenol, and adjusting the density of the suspension to 6 cm as measured by the Gates nephelometer. Some difficulty was experienced in obtaining an entirely satisfactory antigen, as there was a tendency to auto-agglutination in fine granules. In carrying out the test, the tubes were incubated at 37.5° for 18 to 24 hours.

The results of the tests show that a diagnosis of infection with *E. rhusiopathiae* can be made by means of the agglutination test. Complete agglutination at a dilution of 1:100 or higher is definitely positive. Tests on clinical field cases showed maximum titres of complete agglutination at 1:800 up to 1:25 000. Inoculated lambs showing clinical symptoms developed agglutinin titres from 1:800 to 1:25,000. Very young lambs which had not been exposed to infection gave negative reactions at 1:25, but some older lambs and mature sheep showed partial agglutination in some cases as high as 1:100. Therefore, a definite posi-

*Contribution from Montana State College, Agricultural Experiment Station, Paper No. 26, Journal Series. Received for publication, November 2, 1932.

TABLE I—*Agglutination reactions.*

ANIMAL	DILUTIONS											
	1/25	1/50	1/100	1/200	1/400	1/800	1/1600	1/3200	1/6400	1/12,800	1/25,000	1/50,000
Field case	++	++	++	++	++	++	++	++	+	+	±	−
Field case	++	++	++	++	++	++	++	+	±	−	−	−
Field case	++	++	++	++	++	++	++	+	+	±	−	−
Field case	++	++	++	++	++	++	+	+	±	−	−	−
Inoculated intravenously	++	++	++	++	++	++	++	++	++	+	±	−
Umbilicus inoculated	++	++	++	++	++	++	++	++	+	+	−	−
Umbilicus inoculated	++	++	++	++	++	++	++	++	+	±	−	−
Umbilicus exposed to infected bedding	++	++	++	++	++	++	++	++	+	−	−	−
Umbilicus exposed to infected bedding	++	++	++	++	++	++	++	++	+	−	−	−
Docking wound exposed to infected bedding	++	++	++	++	++	++	++	++	+	−	−	−
Docking wound exposed to infected bedding	++	++	++	++	++	+	±	−	−	−	−	−
Castration wound exposed to infected bedding	++	++	++	++	+	±	−	−	−	−	−	−
Castration wound exposed to infected bedding	++	++	++	++	++	+	±	−	−	−	−	−
Normal young lamb	+	−	−	−	−	−	−	−	−	−	−	−
Normal young lamb	−	−	−	−	−	−	−	−	−	−	−	−
Normal ewe	++	+	±	−	−	−	−	−	−	−	−	−
Normal ewe	+	−	−	−	−	−	−	−	−	−	−	−
Normal ewe	−	−	−	−	−	−	−	−	−	−	−	−

++ = Complete agglutination. + = Partial agglutination. ± = Very slight agglutination.

tive diagnosis is not made unless there is complete agglutination at least as high as 1:100. The reactions in lower dilutions in sheep for which there was no history of clinical arthritis may indicate sufficient exposure to develop some agglutinins without the infection having established itself in the animal.

Table I shows a number of typical reactions, including field cases, experimentally infected lambs, young normal lambs, and normal ewes.

Intravenous Inoculation

On April 30, 1930, lamb A-107, born April 21, and lamb A-108, born April 22, were inoculated intravenously with a culture of

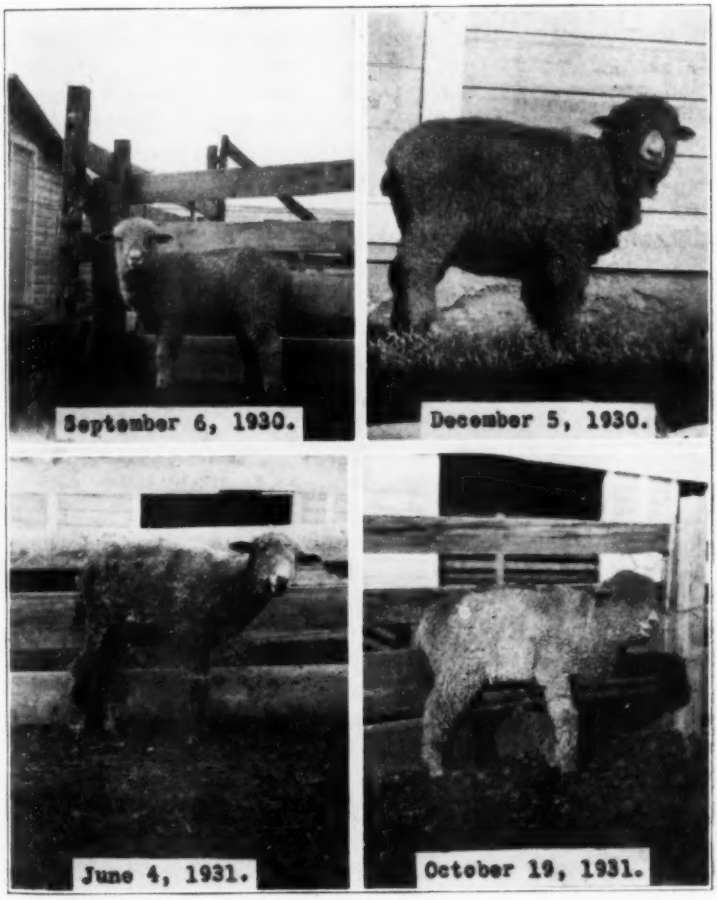

Fig. 1. Sheep A-107, at different stages of chronic arthritis resulting from intravenous inoculation with *E. rhusiopathiae*.

strain 85 of *E. rhusiopathiae*. This strain was isolated from a case of lamb arthritis in 1925. The dose used was 1 cc of a suspension in 3 cc of physiological salt solution of the growth on one serum-agar slant. No immediate effect was observed in either case, but on June 4, a slight stiffness of gait was observed in lamb A-107, and June 7, lamb A-108 was lame in the right hind leg. On examination, no joint enlargement could be determined in either case.

The lameness in the right hind leg of lamb A-108 soon became very marked, so that the leg was used very little. On August 16, three and one-half months after inoculation, this lamb was killed for study of the lesions. At this time the lameness was less severe than it had been early in July. The only lesions found on autopsy were in the right hind leg. The right femoro-tibial joint was slightly enlarged, due to thickening of the joint capsule and its distention with an excess of synovial fluid. The entire inner surface of the joint capsule showed inflammation, with petechial hemorrhages. There were vascular vegetative fringes at the borders of the articular surfaces continuous with the inflamed inner surface of the capsule. The synovial fluid was turbid, but there was no pus. Smears from the fluid showed many leucocytes, but no bacteria were seen. The right tarsal joint showed a slight amount of inflammatory reaction.

Cultures from the fluid in the femoro-tibial joint developed pure *E. rhusiopathiae*.

The stiffness of gait observed in lamb A-107 became gradually more marked. On July 16, it was noted that the motion of both hind legs was limited. The general condition of the lamb was poor, and she failed to grow normally. She was carried through the fall and winter, and on March 17, 1931, when she was eleven months old, she weighed only 54½ lbs., while lamb A-109, of the same age and type, weighed 93 lbs. At this time the motion of the hind legs was very limited, and she carried the two hind legs forward with a "humping" motion with practically no flexion of the joints (figs. 1 and 2). Her appearance and gait were exactly similar to those of sheep 531 which had developed arthritis on the range during the summer of 1930. Her blood serum agglutinated *E. rhusiopathiae* completely at 1:6,400 and slightly at 1:25,000.

Lamb A-107 was carried until January 30, 1932. On January 25, 1932, when she was 21 months old, she weighed only 63 lbs., while lamb A-109 weighed 110 lbs. at the same age. On January 30, she was killed and a careful autopsy made. The character-

istic lesions were found in both hip joints, both femoro-tibial, and both tarsal joints. Lesions were found also in the right carpal and right elbow joints. There were numerous minute gray foci in the liver and on the surface of the kidney beneath the capsule. Cultures from the joints developed pure *E. rhusiopathiae*, but this organism was not recovered from the liver and kidney lesions.

The results of the intravenous inoculations established the fact that the disease could be reproduced by inoculation of *E. rhusiopathiae*. The question then arose as to the portal of entry in naturally occurring cases. Clinical experience indicates that the infecting agent may gain access to the body through the umbilicus at birth or through docking and castration wounds.

FIG. 2. Infected yearling (A-107) on left weighed 54 pounds. Healthy yearling on right weighed 93 pounds.

Hopkirk and Gill,[2] who have studied a similar condition in New Zealand, believe "that infection occurs under natural circumstances through docking and castration wounds." They report a few experiments which support this opinion. We have carried out several experiments on a considerable number of lambs to determine whether arthritis can be produced by exposure of the umbilical cord and docking and castration wounds to infection with *E. rhusiopathiae*. (See figs. 3, 4, 5 and 6.)

EXPERIMENT 1. UMBILICAL INOCULATION OF CULTURES

Six new-born lambs were inoculated with a strain of *E. rhusiopathiae* recently isolated from a case of arthritis. The growth on one serum-agar slant, suspended in 3 cc of .85 per

cent sodium chlorid solution, was injected into the stump of the umbilical cord, and the end of the cord was ligated to retain the injected material. Table II shows the results of the inoculation.

All of these lambs developed an acute lameness in from four to seven days. The first symptom noticed was a general stiffness of movement which localized in a day or two in one or more legs. In some cases there was visible enlargement of a joint. It was evidently very painful to place weight on the affected legs. This condition persisted from a few days to two weeks, after which the acute symptoms gradually subsided. In three of the six cases there was a short period about five or six weeks after inoculation when no lameness could be detected. Following this period, slight stiffness of gait developed, which became chronic. Chronic lameness failed to develop in one case, but the five other lambs eventually developed stiffness in the hindquarters similar to that described as the result of intravenous inoculation. Regardless of the seat of the original lameness, the femoro-tibial joints were affected in all cases. The lambs failed to grow normally. The five lambs which became chronically lame developed a high agglutinin titre. The one lamb which failed to develop chronic lameness remained negative to the agglutination test.

Lamb B-5 died from some other cause three and one-half months after inoculation. Autopsy showed the characteristic lesions in both carpal and both femoro-tibial joints, and in one tarsal joint. The internal inguinal, precrural and popliteal lymph-glands were enlarged. *E. rhusiopathiae* was recovered in pure culture from the joint lesions.

Lamb B-6 died from unknown cause two and one-half months after inoculation. The characteristic lesions were found in both femoro-tibial joints, and in the left carpal and left tarsal joints.

Lamb B-7 was carried until it was one year old. At this time it weighed only 57 lbs., and was very stiff in the hindquarters, the gait being similar to that shown by lamb A-107, inoculated intravenously. Autopsy showed the characteristics lesions in both femoro-tibial joints. Cultures failed to develop the causative organism.

EXPERIMENT 2. EXPOSURE OF UMBILICUS TO INFECTED BEDDING

In this experiment the purpose was to simulate the conditions under which natural infection might occur. Seven new-born lambs were placed with their mothers in pens which were bedded with a thin layer of corral soil which was sprinkled with broth

TABLE II—*Umbilical inoculation with cultures.*

LAMB	DATE OF BIRTH	METHOD OF INOCULATION	AGE WHEN LAMENESS APPEARED	RESULT	AGGLUTININ TITRE				
					4-28-31	5-26-31	6-24-31	7-16-31	9-15-31
B-5	2-10-31	Culture of 227 injected into stump of umbilical cord	6 days	Chronic arthritis	3200	3200			
B-6			7 days	Chronic arthritis					
B-7	2-12-31	Culture of 277 injected into stump of umbilical cord	6 days	Chronic arthritis	3200	6400	6400	25,000	6400
B-10	2-14-31		5 days	Recovered	–			–	100
B-11	2-16-31	Cord dropped in suspension of culture of 277	4 days	Chronic arthritis	800	400	800+	400	200
B-12			5 days	Chronic arthritis	800	3200	3200	3200	200
B-16			No symptoms					–	50

TABLE III—*Exposure of umbilicus to infected bedding.*

LAMB	DATE OF BIRTH	AGE WHEN LAMENESS APPEARED	RESULT	AGGLUTININ TITRE			
				5-26-31	6-24-31	7-16-31	9-15-31
B- 83	4-1-31	No symptoms	Negative		–	–	50
B- 84		No symptoms	Negative		–	–	50
B- 89		16 days	Chronic arthritis	–	–	100+	
B- 90		No symptoms	Negative	800	800+	400	
B-117	4-9-31	8 days	Chronic arthritis	800	800+	3200	
B-118		75 days	Chronic arthritis	1600	800+	3200	
B-119		6 days	Chronic arthritis. Recovered	–	–	–	

FIG. 3 (upper left). Field case of chronic erysipelothritic arthritis. Symptoms exactly like those of experimental cases. Note the stiff carriage of the hind legs, and the fact that weight is not placed on the left foreleg.

FIG. 5 (lower left). Chronic arthritis resulting from inoculation of umbilical cord with *E. rhusiopathiae*.

FIG. 4 (upper right). Arthritis resulting from inoculation of umbilical cord with *E. rhusiopathiae*. Acute stage.

FIG. 6 (lower right). Arthritis resulting from exposure of docking wound to bedding sprinkled with culture of *E. rhusiopathiae*. Acute stage.

cultures of *E. rhusiopathiae*. From 500 to 700 cc of culture was sprinkled over an area of about 12 square feet. The lambs were held in the pens from two to four days. The results of this exposure are shown in table III. Four of the seven lambs developed clinical arthritis, the lameness appearing in six days in two cases, in 16 days in a third, and after 75 days in the fourth. Three of these four lambs developed specific agglutinins in the blood. One recovered from the disease, clinically, and this lamb never developed agglutinins. One of the three lambs which showed no symptoms developed a high agglutination titre. Two of the clinical cases were killed, one at four months and the other at ten months. Both showed the characteristic joint lesions. The lesions were cultured in only one case, without recovery of the organism.

In this group of lambs the results are quite comparable to the conditions found in the field, where in some cases no symptoms are observed until the lambs are several months old, while in other cases the acute symptoms appear in the first month of life, to be followed by apparent recovery and the later development of chronic arthritis.

Experiment 3. Inoculation of Docking Wound

In this experiment a broth culture of *E. rhusiopathiae* was applied on a swab to the docking wound 24 hours after docking. Six lambs were used for the test. Two of the six lambs developed a slight chronic lameness four months after docking. Neither of them developed a definitely positive agglutination titre. Three others, which never developed any visible lameness, showed agglutination in dilutions which are considered definitely positive.

Experiment 4. Exposure of Docking Wound to Infected Bedding

This experiment was designed primarily to determine whether arthritis could be produced by exposing the docking wound to infected bedding and incidentally to determine whether the method of docking had any relation to the occurrence of the disease.

Twenty-seven ram lambs, varying in age from 12 to 18 days, were used. They were castrated with the emasculatome, in order to avoid any open wound except that caused by docking. Three methods of docking were used. Nine lambs were docked with a knife, nine were docked with an emasculator, and nine were docked with a hot iron. Immediately after docking, the

TABLE IV—*Exposure of docking wound to infected bedding.*

LAMB	DATE OF BIRTH	DATE DOCKED	METHOD OF DOCKING	RESULT	DATE LAMENESS NOTICED	AGGLUTININ TITRE			
						5–26–31	6–24–31	7–16–31	9–15–31
B-19	3–18–31			Arthritis	6–24–31		800+	200	100
B-20	3–18–31	4– 3–31		Negative			–	50	100
B-40	3–23–31			Negative			25	–	50
B-45	3–24–31			Arthritis	4–25–31	50	–	800	800+
B-47	3–24–31		Knife	Negative			100	100	50
B-68	3–29–31	4–11–31		Arthritis	4–25–31	–	100	100	100
B-70	3–29–31			Negative		–	–	–	–
B-71	3–29–31			Arthritis	4–25–31	–	800+	50	200
B-73	3–29–31			Arthritis	6–24–31		800+	3200	1600
B-22	3–18–31			Negative			50	–	50
B-24	3–19–31	4– 3–31		Negative			–	50	100
B-28	3–21–31			Negative			25	50	25
B-46	3–24–31			Arthritis	9–28–31		200	200	400
B-52	3–25–31		Emasculator	Arthritis	4–17–31	400	800+	400	800
B-53	3–25–31	4–11–31		Negative		–	50	–	100
B-57	3–26–31			Arthritis	4–25–31	50		100	400
B-64	3–28–31			Negative		–	–	–	–
B-74	3–30–31			Arthritis	4–25–31		800+	400	800
B-25	3–21–31	4– 3–31		Negative			50	100	100
B-29	3–22–31			Negative			200	800	50
B-41	3–24–31			Negative			–	–	–
B-44	3–24–31		Hot iron	Negative		–	100	25	200
B-58	3–26–31	4–11–31		Negative		–		–	100
B-66	3–28–31			Negative		–	100	–	200
B-72	3–29–31			Negative			–	100	100

lambs were placed in infected pens prepared in the same manner as for experiment 2.

The results of the exposure are shown in table IV. Clinical arthritis developed in nine of these lambs, the time between exposure and the appearance of symptoms varying from six days to five and one-half months. In one case lameness appeared in six days; in five cases the interval was 14 days; in two cases two and one-half months; and in one case five and one-half months. Eight of the nine clinical cases developed a high agglutinin titre, which confirmed the diagnosis. Nine lambs which did not develop recognizable clinical symptoms showed agglutinin titres high enough to indicate some infection.

One of the affected lambs (B-52) was killed at the age of seven months. Autopsy showed the characteristic lesions in the left carpal and right femoro-tibial joints. A pure culture of *E. rhusiopathiae* was recovered from the affected carpus.

A comparison of the results of the three methods of docking shows that of the nine lambs docked with the knife, five developed clinical arthritis; of the nine lambs docked with the emasculator, four developed clinical arthritis; and of the nine lambs docked with the hot iron, two died within a few days from other causes, and none of the surviving seven became lame.

In order to check the indications of this experiment as to the relation of the method of docking to the incidence of arthritis, a similar experiment was carried out during the following lambing season, in which 81 lambs were used. Twenty-four of these lambs were docked with a knife, 25 were docked with an emasculator, and 32 were docked with a hot iron. The percentages of clinical cases developing in this series were: in the knife group, 17 per cent; in the emasculator group, 16 per cent, and in the group docked with the hot iron, 6 per cent. The percentages of serological reactions were: in the knife group, 33 per cent; in the emasculator group, 52 per cent, and in the hot iron group, 19 per cent.

Experiment 5. Exposure of Castration Wound to Infected Bedding

Eleven lambs were castrated with castrating shears, and were placed immediately in infected pens prepared in the same manner as described for experiments 3 and 4. These lambs were not docked until a week later, so that the only wounds exposed to the infection were the castration wounds.

TABLE V—*Exposure of castration wound to infected bedding.*

LAMB	DATE OF BIRTH	DATE OF CASTRATION	RESULT	DATE SYMPTOMS NOTICED	AGGLUTININ TITRE	
					7–8–31	7–16–31
B-139	5–21–31	6– 1–31	Negative			–
B-140	5–21–31		Negative			–
B-141	5–22–31		Negative			–
B-142	5–22–31		Negative			–
B-147	5–29–31	6–22–31	Negative			–
B-151	6– 1–31		Arthritis	7– 2–31		200
B-156	6– 3–31		Arthritis	6–30–31		400
B-159	6– 5–31		Arthritis	7– 2–31		25
B-162	6–13–31	7– 3–31	Slightly stiff	7–15–31	50	25
B-164	6–20–31		Slightly stiff	7–15–31	100	25
B-165	6–26–31		Negative		100	–

Table V shows the results of this experiment. Five of the 11 lambs developed some degree of lameness, the symptoms appearing in 8 to 12 days after castration. Two of the five developed a definite chronic arthritis, which was confirmed as specific by the demonstration of a high agglutinin titre. The three other lambs showed only a low agglutinin titre, and two of them recovered clinically in two months.

Discussion

In the three experiments involving exposure to infected bedding, 45 lambs were used, of which fifteen developed clinical cases of arthritis. During the same lambing season, 60 other lambs, handled in the same way except that they were not exposed to cultures of *E. rhusiopathiae*, were carried to the age of four to six months without the occurrence of any cases of chronic arthritis.

These results established the fact that chronic arthritis due to infection with *E. rhusiopathiae* may occur as the result of exposure of the stump of the umbilical cord, the docking wound, or the castration wound to soil which has been impregnated artificially with cultures of the organism. This fact, correlated with the field observations as to the conditions under which arthritis develops naturally, seem to justify the conclusion that the umbilical cord and the docking wound are the principal avenues of infection. It has been observed in the field that in some instances where large numbers of sheep were involved, the disease has been prevented by careful navel disinfection, and in other cases a change in docking methods has accomplished the same purpose.

Conclusions

1. A chronic arthritis, corresponding in every way to the naturally occurring disease, can be produced in lambs by inoculating *Erysipelothrix rhusiopathiae* intravenously or into the umbilical cord.

2. The typical disease can be produced by exposing the stump of the umbilical cord, the docking wound, or the castration wound to soil which has been impregnated with cultures of *E. rhusiopathiae*.

3. Agglutinins for *E. rhusiopathiae* are produced in the blood of both naturally and artificially infected animals.

4. A comparison of three methods of docking indicates that infection is much less likely to occur following docking with the hot iron than with the knife or the emasculator. The experi-

mental results are confirmed by field experience with docking methods.

5. The experimental results correlated with field experience justify the conclusion that the principal portals of entry of this infection are the umbilical cord at birth and the docking and castration wounds.

6. Preventive measures include lambing sanitation, navel disinfection at birth, docking on grass if possible, and docking with the hot iron in some form.

REFERENCES

[1]Marsh, H.: The bacillus of swine erysipelas associated with arthritis in lambs. Jour. A. V. M. A., lxxviii (1931), n. s. 31 (1), pp. 57-63.

[2]Hopkirk, C. S. M., and Gill, D. A.: Arthritis in lambs in New Zealand. Vet. Rec., x (1930), pp. 919-923.

New York Broadcasting Program

Under the auspices of the Committee on Broadcasting, New York State Veterinary Medical Society, the following talks were given over Station WGY (General Electric Station) during the latter part of February and in March and April:

February 15—"Mastitis," Dr. D. H. Udall, New York State Veterinary College, Ithaca.

February 22—"Protecting Our Accredited Herds," Dr. P. V. Weaver, Greenwich.

March 1—"Animal Parasites Affecting Man," Dr. D. W. Baker, New York State Veterinary Medical Society, Ithaca.

March 24—"Lice and Fleas on Farm Animals," Dr. G. A. Knapp, Millbrook.

April 7—"Herd Management in Spring," Dr. A. M. Mills, Borden Farm Products Co., Goshen.

April 21—"It is Time to Re-Define Aims in Milk Control," Dr. J. D. Brew, New York State Health Dept., Albany.

During May and June, the following talks are scheduled:

May 5—"Vegetable Poisons in Pastures," Prof. W. C. Muenscher, New York State College of Agriculture, Ithaca.

May 19—"Shoulder and Neck Care—Farm Horses," Dr. H. C. Murray, Glens Falls.

June 2—"Farm Yards—Hoof Rot," Dr. C. A. Kehr, Hopewell Junction.

June 16—"Monday Morning's Diseases," Dr. J. S. Carnrite, Fort Plain.

June 30—"Flies and Similar Pests," Dr. Harris Moak, Brooklyn.

This broadcast, which formerly was given on Wednesday each week, is now given every two weeks, on Friday, at 12:30 p. m., E. S. T.

MOSQUITOES AS VECTORS OF THE VIRUS OF EQUINE ENCEPHALOMYELITIS*

By Major R. A. KELSER, *V. C., U. S. Army,*
Army Medical School, Army Medical Center,
Washington, D. C.

At a seminar at the Army Medical School on March 17, 1933, and subsequently at a meeting of the Washington Branch of the Society of American Bacteriologists held March 21, 1933, the author presented a preliminary report on the ability of mosquitoes to transmit the virus of equine encephalomyelitis to guinea pigs. At the time the report was made to the two organizations mentioned, a mosquito-feeding experiment was under way with a horse, but up until that time the animal had shown no ill effects from the mosquito bites. Subsequently, however, this animal developed encephalomyelitis and died as a result thereof. Thus, we are now in a position to state definitely that mosquitoes are capable of transmitting the virus of equine encephalomyelitis, not only to guinea pigs but also to horses.

There is presented in the following paragraphs a brief summary of this work. A full, detailed treatise will be published at a later date.

The virus employed in these experiments was originally obtained from a natural case of the disease occurring in a horse in August, 1932, in South Dakota. It was furnished the Army Medical School in September, 1932, by Dr. H. W. Schoening, Chief of the Division of Pathology, U. S. Bureau of Animal Industry.

The mosquitoes used were *Aedes aegypti*, from stock which has been maintained by the Army Medical School, under laboratory conditions, since 1925, the original stock having been brought from the Philippine Islands.

The guinea pigs used weighed between 250 and 300 grams each. They were from carefully selected stock and had undergone our usual period of quarantine and observation before being placed in the experiments.

Following numerous passages of the virus through guinea pigs, and preliminary studies to determine the periods the blood of infected guinea pigs contained virus, three guinea pigs were inoculated for use in the mosquito-transmission experiments. One of these three pigs was inoculated both intracutaneously

*Received for publication, April 3, 1933.

and intracerebrally. The other two were inoculated only by the intracutaneous route.

Commencing 48 hours after the infection of the guinea pigs, a lot of 50 *Aedes aegypti* was permitted to feed on these three guinea pigs. The following day—72 hours after the inoculation of the guinea pigs—a second lot of 50 mosquitoes was fed on the pigs. This procedure was repeated the following day with another lot of mosquitoes. On the morning of the fifth day following the inoculation of the guinea pigs, the animal that had received both the intracutaneous and intracerebral injections was dead. Hence, our next lot of mosquitoes fed only on the two pigs which had received the intracutaneous inoculations. The following day—144 hours after the infection of the guinea pigs—another lot of 50 mosquitoes was permitted to feed on the pigs, which were then in the late stages of the disease. By the following morning, both of these guinea pigs were dead.

Thus, we had five lots, each consisting of fifty mosquitoes, which had fed on guinea pigs infected with equine encephalomyelitis virus, 48, 72, 96, 120 and 144 hours respectively, subsequent to the inoculation of the pigs.

Experience has shown that this species of mosquito, under laboratory conditions, will draw blood approximately every six or seven days. Hence, we permitted the mosquitoes of each of our five lots to feed on a normal guinea pig on the sixth day following their initial feeding on the infected guinea pigs. The picture can be presented best by giving consecutively the results obtained with one lot of mosquitoes before taking up the next lot.

Starting with the 48-hour lot of mosquitoes, it should be stated that we killed two of the mosquitoes of this lot immediately after they had fed on the infected guinea pigs. These two mosquitoes were then ground in a little physiological saline solution and injected intracutaneously into a guinea pig. This guinea pig died of encephalomyelitis eight days later. Six days subsequent to the initial feeding of this lot of mosquitoes on the infected pigs, they were fed on a normal guinea pig. This pig died of encephalomyelitis eight days later. After an additional six days (twelve days after the original infective meal), this lot of mosquitoes was fed on another normal guinea pig. This animal died of the disease on the ninth day following, but showed symptoms of paralysis as early as the sixth day. Then, eighteen days after this lot of mosquitoes had partaken of their original infective meal, they were permitted to feed on two normal guinea pigs. Both of these pigs died of encephalomyelitis on the sixth day following the exposure to the mosquitoes.

The mosquitoes of the 72-hour lot were fed on a normal guinea pig on the sixth day subsequent to their meal on the infected guinea pigs. This pig died of encephalomyelitis six days later. The intracutaneous inoculation of a small amount of an emulsion of the brain of this animal into two normal guinea pigs produced encephalomyelitis, and death in both cases on the seventh day. The brains of these two animals were then emulsified and a small amount inoculated intracutaneously into each of three normal guinea pigs. Two of these three animals died of the disease, one on the sixth day and the other on the ninth day. Twelve days after their infective meal, this lot of mosquitoes was fed on three normal guinea pigs, and at the same time two of the mosquitoes were killed and inoculated intracutaneously into a fourth normal guinea pig. This latter pig died of encephalomyelitis eight days later. During the feeding of the mosquitoes on the other three pigs, it was noted that one of these pigs (a white one) was bitten by only 3 or 4 mosquitoes, the insects preferring to feed on the other two animals which were dark in color. These two dark-colored pigs died of encephalomyelitis on the fourth and sixth days respectively, following the mosquito bites. The white pig survived. When the time for the third test-feeding of this group of mosquitoes arrived, we had obtained a horse, so, instead of feeding the mosquitoes on one or more guinea pigs, we placed them on the horse. The results with the horse will be discussed a little farther along.

On the sixth day following their feeding on the original three infected guinea pigs, the mosquitoes of the 96-hour lot were fed on a normal guinea pig. This animal died of encephalomyelitis six days subsequently. Twelve days subsequent to the feeding on the infected guinea pigs, this lot of mosquitoes was permitted to feed on three guinea pigs. All three of these latter animals have remained healthy. When the time for the third test-feeding of this group of mosquitoes arrived (18th day), this lot, like the 72-hour lot, was fed on the horse.

The mosquitoes of the 120-hour lot were fed on one normal guinea pig on the sixth day following their feeding on the original two intracutaneously-injected guinea pigs. This pig died of encephalomyelitis on the tenth day following. Then, after another period of six days, this lot of mosquitoes was fed on two normal guinea pigs. One of these died of encephalomyelitis six days later; the other has remained healthy. As with the two former lots of mosquitoes, the 120-hour lot was fed on the horse rather than on guinea pigs, when the time for the third test-feeding arrived.

The mosquitoes of the 144-hour lot were fed on normal guinea pigs 6, 12, 18 and 24 days respectively, after their initial feeding on the originally infected guinea pigs. The guinea pigs bitten by this lot of mosquitoes have all remained healthy.

As indicated above, the horse used in this experiment was bitten by mosquitoes of the 72-hour lot, 96-hour group, and 120-hour lot. In the meantime, by the procedure we had previously employed, we fed four new lots of mosquitoes (50 in each lot) on infected guinea pigs. Thus, these four lots consisted of mosquitoes which had fed 48, 72, 96 and 120 hours respectively, following the inoculation of the guinea pigs used to infect the insects. Then, mosquitoes of each of these four lots were fed on the horse on the sixth day following their initial feeding on the infected guinea pigs. The horse we used was thus exposed to a total of seven groups of mosquitoes within 16 days. The number of mosquitoes in these seven groups which engorged on the horse totaled approximately 110.

The horse showed a slight temperature rise (2 degrees) on the eleventh day following the date on which the first lot of mosquitoes fed on it, but manifested no other evidence of abnormality. However, on the 22nd day subsequent to the date we fed the first group of mosquitoes on this animal, it developed a temperature rise which, within 24 hours, reached 106° F. Shortly following the onset of fever, the horse developed the classical symptoms of encephalomyelitis, and died as a result of the disease on the fifth day.

Obviously, from this experiment, we do not know which of the seven lots of mosquitoes was responsible for the disease in the horse. Our object in this particular test was to determine whether or not mosquitoes could transmit the disease to the equine genus. Our results make it possible to answer this in the affirmative. Supplementary experiments, now in progress, should clear up questions of various details.

In conclusion, it may be stated that we have produced encephalomyelitis, due to the filtrable virus of the equine disease, in numerous guinea pigs, and in a horse, through the agency of mosquitoes of the species *Aedes aegypti*. The mosquitoes proved infectious as early as the sixth day following feeding on an infected animal, and remained infectious for at least 18 days subsequent to the infective meal. It is possible that the mosquitoes may be capable of transmitting the disease earlier than the sixth day after an infective feeding, and it is highly probable that they remain infectious for a much longer period than 18 days. Tests to clear up these points are in progress.

In our guinea-pig tests, mosquitoes were infected by feeding on artifically inoculated guinea pigs 48 and 72 hours subsequent to the inoculation of the pigs, and to a lesser extent, 96 and 120 hours after the infection of the guinea pigs. Mosquitoes, fed on the inoculated guinea pigs 144 hours subsequent to the inoculation, failed to become infective. These periods of infectivity of the inoculated guinea pigs for the mosquitoes followed in general the period of fever in the pigs.

Since the classical work of Meyer, Haring and Howitt, proving that the American type of equine encephalomyelitis is due to a filtrable virus, speculation has existed as to the natural mode of infection. We believe that the results we have reported, coupled with epizoölogical observations, indicate that the disease is naturally transmitted by insect vectors—very probably mosquitoes. While it is understood that the particular species of mosquito (*Aedes aegypti*), which figured in our experiments, is not likely to be found in a number of the areas where encephalomyelitis has been enzoötic, other species of this same genus (Aedes) do occur in such areas and in all probability are as capable of transmitting the disease as the *aegypti* species.

California Has New State Veterinarian

Dr. C. U. Duckworth (Ind. '21), of Los Angeles, Calif., has succeeded Dr. Joseph J. King (San Fran. '13) as Chief of the Division of Animal Industry, California Department of Agriculture, Sacramento. Dr. Duckworth reënters state control work in California at a critical time in the progress of its tuberculosis eradication program, and it is believed that his experience in matters relating to the dairy industry, both in private and public connections, will be of great value to all interests concerned.

Doctor Youngberg in New Role

Dr. Stanton Youngberg (O. S. U. '07) completed his term of office as Director of the Bureau of Animal Industry, Philippine Department of Agriculture, on December 31, 1932, and is now employed as a technical adviser on the staff of the Governor-General, detailed to the Department of Agriculture and Commerce. On March 29, Dr. Youngberg left Manila for Hong Kong, Canton and Shanghai, on official business for the Government of the Philippine Islands.

Dr. Victor Buencamino (Corn. '11) has succeeded Dr. Youngberg as Director of the Bureau of Animal Industry.

A PRELIMINARY REPORT OF AN APPARENTLY NEW RESPIRATORY DISEASE OF CHICKENS*

By JOHN P. DELAPLANE *and* HOMER O. STUART
Rhode Island Agricultural Experiment Station
Kingston, Rhode Island
and
HUBERT BUNYEA
U. S. Department of Agriculture, Washington, D. C.

In the latter part of June, 1932, an apparently new respiratory disease, which made its appearance almost simultaneously in several poultry establishments in various sections of the State, was brought to the attention of the Poultry Department of the Rhode Island State College, Kingston, R. I. It was later observed in two flocks of pheasants in the State.

The disease was obviously of an infectious and contagious nature, as it spread rapidly through the flocks in question. The federal Bureau of Animal Industry was invited to coöperate in an investigation of the problem. This brief note is a joint report of the preliminary findings of the Poultry Department of the Rhode Island State College and the Pathological Division of the Bureau of Animal Industry.

The principal manifestations of the disease as it was observed by the writers were those of an exudative rhinitis and sinusitis. There was no appreciable or consistent involvement of the larynx, trachea or bronchi. However, the visible membranes of the eye were subject to marked degrees of inflammation, manifested by reddening, swelling and photophobia, with more or less profuse foamy lacrimation. In the course of one or more days, this lacrimation would give way to a sticky mucofibrinous or muco-purulent exudation, which tended to glue the eyelids. Profuse exudates of a similar character, although sometimes

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blood-stained, were manifested in the nasal tract and sinuses. In some few cases, a generalized edema of the regions of the head and neck was noted. The subcutaneous swellings, particularly those around the eyes, were somewhat discolored, being slightly yellowish-green in character. Affected fowls soon ceased to eat and rapidly became emaciated. The disease spread with great rapidity in affected flocks, and the death rate was high, particularly in young fowls, with the same general train of symptoms as above described.

At the onset of the disease, there was more or less elevation of body temperature, sometimes ascending as much as three de-

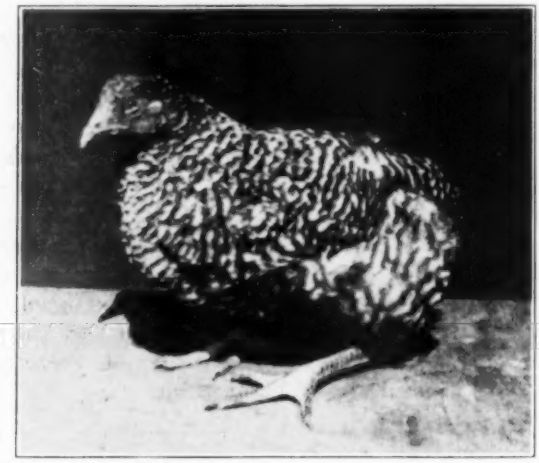

FIG. 1. Bird suffering from rhinosinusitis infection.

grees above normal. As the disease progressed, the temperature became subnormal, the fowl appeared dejected, and, in some instances, coma and finally death ensued.

The incubation period of the disease, in the limited observations made by the writers, appeared to be about two to three days. The mortality from the disease appeared to be due to some toxic principle.

All of the places where the new disease prevailed were within an approximate radius of thirty miles. No evidence was available that in any way accounted for the origin of the enzoötic. There was no history of any connections between the several outbreaks. A liberal number of freshly-killed specimens of the disease were secured from the respective flocks for laboratory examination. Since the onset of the disease in the above-men-

tioned area, isolated outbreaks have been noted in other sections of the country.

Upon autopsy, no characteristic pathological changes were noted beyond the general inflammatory and exudative rhinitis and sinusitis already described. No lesions were observed in the body cavity except a slight trace of petechial hemorrhage on the coronary fat of some of the hearts examined.

Thus far, no pathogenic organisms capable of reproducing the disease have been isolated from the organs or air-passages.

The disease is readily reproduced in susceptible fowls by inoculation into their nasal passages and eyes, using the nasal exudates of diseased birds.

A number of attempts to determine whether the virus is filtrable have been made with negative results. The filters that have been tried were the Berkefeld V, Berkefeld N, Mandler N, Jenkins and Seitz.

Cross-immunity tests to determine whether there was any connection between the virus of laryngotracheitis and the new disease show that fowls that have recovered from laryngotracheitis are susceptible to the new disease, and fowls that have recovered from the new disease are susceptible to laryngotracheitis.

Inoculations of the pigeon, turkey, sparrow and crow with the virus of the new disease have given negative results.

This report, covering the work thus far completed, indicates the descriptive characteristics of the disease and the attempts made to identify the causative organism and, therefore, is to be considered as a preliminary publication.

AN EXTREME CASE OF URINARY CALCULI IN A LAMB*

By J. F. BULLARD, *LaFayette, Ind.*
Purdue University Agricultural Experiment Station
Department of Veterinary Science

A grade Southdown lamb, approximately 18 months of age, was brought to the laboratory for examination. Upon arrival it was in a state of coma. It also showed an extensive edema around the anus and perineal region. The skin over these parts was bluish-purple and subnormal in temperature.

The lamb was destroyed and autopsied. When the abdominal cavity was opened, a thick-walled abscess was found on the peri-

*Received for publication, March 20, 1933.

toneal surface of the abdominal floor in the region of the umbilicus. It contained about an ounce of a thick, greenish-yellow pus. The bladder was just posterior to the abscess, to which it was firmly attached by connective tissue adhesions. The bladder was small and, when opened, it was found to contain about half a teaspoonful of fine, sandy calculi.

The entire urogenital tract was carefully dissected out and examined. The pelvic cavity was filled with an extensive hemorrhagic edema which gave a distinct odor of urine. This edema extended down the medial aspect of each leg nearly half way

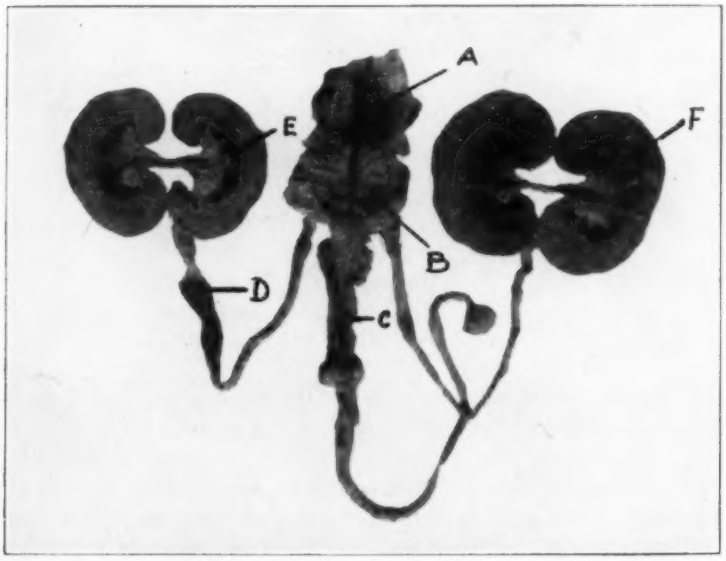

FIG. 1. Urinary calculi. A, abscess; B, bladder; C, point of rupture in urethra; D, opened left ureter showing calculi; E and F, calculi in distended pelvices of left and right kidney respectively.

to the hocks. In the pelvic area rupture was found in the urethra. Fine calculi were present in the tissues immediately adjacent to the rupture.

Both kidneys were slightly enlarged and very hard and firm, with a thickened capsule which in each case was firmly attached. Longitudinal sections showed pressure atrophy and fibrosis as evidenced by the very thin cortex and medulla. This was caused, no doubt, by the greatly distended pelvices, which were filled with a hemorrhagic mucopurulent exudate containing a large number of very fine sand-like calculi.

The left ureter was very fine and cord-like for a distance of

about three inches, starting immediately from its origin at the pelvis. The same fine, sand-like calculi were found here. Only a very small accumulation of calculi could be felt in the right ureter.

There was no edema in the sheath or along the ventral abdominal wall, nor was there any ascites.

POSTTONSILLAR FIBROSARCOMA IN A DOG*

By GERRY B. SCHNELLE, *Boston, Mass.*
Angell Memorial Hospital

The subject was a male mongrel Greyhound, *thirteen months* old when admitted on July 21. There was a history of an inability to eat for four days and of a noisy, difficult respiration.

Nembutal was administered and examination revealed a glossy, lobulated mass attached by a somewhat pedunculated base to the posttonsillar region. It measured approximately two inches at its greatest diameter and three-fourths inch at its smallest. In a prone position, under anesthesia, it completely covered the epiglottis, so a hasty operation was performed to prevent strangulation.

The mass shelled out nicely from its mucous sac and the dog did so well that it was sent home in 36 hours. Sections were made at that time.

Just twenty days after the previous operation, the dog was returned to the hospital. This time it was still eating but made strangling noises on inspiration. Preparation was made for operation. We attempted a more complete excision, under nembutal, as before. By use of the electric cold spark loop, we dug out the attachment of the neoplasm just posterior to the left tonsil. The dog made a nice recovery.

When examined on October 21 there was no sign of recurrence, but by November 30 the tumor showed as a rounded mass spreading down through the pharynx. The animal was destroyed.

Microscopic examination showed a rapidly growing spindle-celled neoplasm apparently of the fibroblastic group. There were numerous small capillaries and numerous mitotic figures. Diagnosis: fibrosarcoma.

COMMENT

Feldman states that fibroma may occur in the throat and that fibrosarcoma may occur where the benign type is found. The

*Received for publication, March 27, 1933.

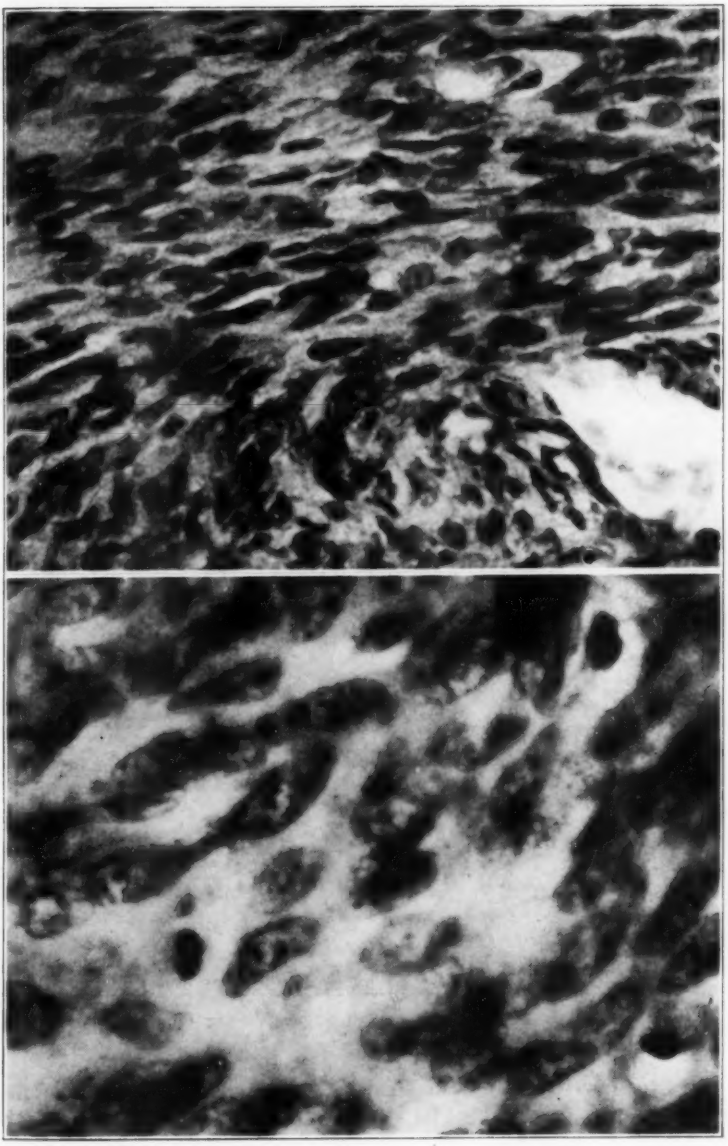

FIG. 1 (above). Fibrosarcoma in a dog (x 550).
FIG. 2 (below). Same (x 1190).

(Photomicrographs by Dr. Sidney Farber, Children's Hospital, Boston, Mass.)

numerous mitotic figures indicating rapidity of growth must make the prognosis extremely unfavorable. In spite of the number of times that malignancies of this type have been reported in animals as young as this (thirteen months), many veterinarians still are influenced by the age factor in diagnosis.

AN EASY METHOD OF SUPPLYING IRON AND COPPER TO BABY PIGS*

By A. J. KNILANS, *Freeport, Ill.*

A large farm in northwestern Illinois, which raises several hundred pigs each year, has had considerable trouble with anemia in pigs, due to the combination of early farrowing, cold weather and lack of clean ground on which to place the pigs.

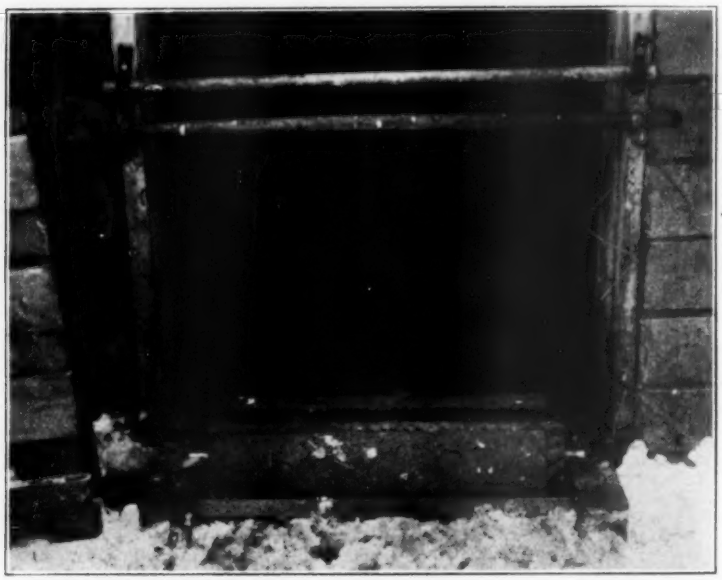

FIG. 1. Mechanical contrivance for administering iron and copper solution.

Dr. Robert Graham's method of preparing iron citrate and copper sulfate was followed, and more or less painting of the udders of the sows was tried during the farrowing season of the fall of 1931 and spring of 1932.

*Received for publication, April 1, 1933.

Many sows would not allow the feeder to paint the iron and copper solution on their udders and some of the men do not have the courage to try to paint the udder of an ugly sow. In order to save time and trouble, the mechanical method, shown in figure 1, was rigged up. The box was filled with the solution of ferric citrate and copper sulfate and placed in the doorway. All sows go to a central feeding-place for swill twice a day. When leaving the house and returning, they go through the doorway and over the roller which is covered with felt. The movement of the sow over the roller soaks her udder with the solution just before she returns to the pigs. (See figure 2.)

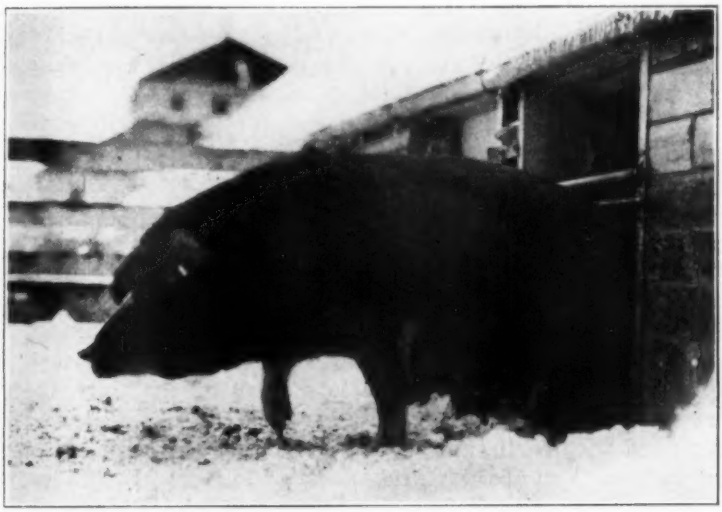

FIG. 2. Brood sow coming out of hog-house and dragging udder over felt-covered roller saturated with medicated solution.

Part of the ration of the sows consists of a mineral mixture (self-fed) which contains the usual supply of ferrous sulfate, and a trace of copper sulfate. In spite of this feeding, the sows are wild about the solution and will eat the felt off the roller and drink the solution just as it is in the box, if opportunity presents.

We have recently been feeding the solution to the sows in their swill, and we also place the mixture in milk and feed in creeps for the pigs. This practice was carried on last fall and again this spring, with the result that the pigs are the best that have ever been raised on the farm.

Without doubt, the iron and copper mixture has been of great value to this drove of hogs and the novel method of administering it has reduced the labor item to a minimum.

NOTES ON THE LIFE CYCLE OF OESTRUS OVIS*

By W. C. MITCHELL *and* N. G. COBBETT
Zoölogical Division, Bureau of Animal Industry
United States Department of Agriculture†

In the course of field investigations on treatment and control measures, some interesting observations were made regarding the length of time *Oestrus ovis* larvae remain in the heads of lambs. The literature[1-3] available to us shows the period necessary for the development of *Oestrus ovis* larvae to the third instar and ready to leave the heads of sheep, to be nine to eleven months. Our evidence is to the effect that larvae reach this stage in a much shorter period.

The first observation was made in Texas, on June 8, when a grub almost ready to leave the host was obtained from the head of a dead lamb that was born in April. Of the lambs killed on July 9 and 20, in connection with the experiments conducted in Texas, 185 head were born during April. From the heads of these lambs many larvae in the late stage of the third instar were secured, and twelve of these were placed in containers partially filled with earth, and the containers kept at ordinary room temperature. Ten of these grubs pupated in from 24 to 72 hours, and seven flies emerged from the pupae in 18 to 22 days.

In New Mexico, heads of young lambs, which were born during April and May, were open and examined in June and July. These heads were secured in the vicinity of Las Vegas at various dipping-vats whenever lambs were drowned in the process of dipping. In the first heads examined during the latter part of June, only early-stage grubs were found but the larvae showed increased development in subsequent examinations of lambs. On July 21, four fully developed larvae were secured from the head of a drowned lamb. This lamb came from a flock in which lambing began on May 10. The grubs were placed in containers partially filled with earth, and the containers kept at ordinary room temperature. Two flies emerged on August 13, and two on August 14.

*Received for publication, April 3, 1933.
†Both authors are members of the field force working under Dr. Marion Imes, Inspector-in-charge, Zoölogical Division, Kansas City, Kan.

In order to secure further information on the development of larvae in lambs in Texas, six lambs, approximately 3½ months old, were isolated from other sheep and kept in pens equipped with tight floors. The first fully developed larvae were collected from the floors of the pens four days after confinement of the lambs, and others were collected on subsequent days, a total of 16 grubs being collected during the 30 days the lambs were confined. As the larvae were collected, they were put into containers partially filled with earth, and the containers kept at ordinary room temperature. Flies emerged from all these naturally expelled larvae in from 17 to 25 days.

These observations of the larval development in the heads of young lambs and the subsequent emergence of adults show that *Oestrus ovis* larvae complete their development in the parasitic stage in spring lambs in Texas and New Mexico in 2½ to 3½ months.

Repeated efforts to capture adults of *Oestrus ovis* were unsuccessful in a majority of instances, but two flies were captured at a dipping-corral in New Mexico, and 21 were taken from the walls of an old building in a sheep pasture in Texas. Upon applying pressure to the abdomens of these flies, one female captured in New Mexico and two of those taken in Texas expelled small masses of minute first-stage larvae. These minute larvae were very active and the mass soon separated as each larva crawled away.

SUMMARY

1. The larvae of *Oestrus ovis* develop to maturity in 2½ to 3½ months in the heads of spring lambs in western Texas and eastern New Mexico.

2. The time required for mature larvae to pupate at ordinary room temperature varied from 12 to 72 hours, and the time required for flies to emerge from these pupae under similar conditions varied from 17 to 37 days. Flies kept in captivity lived from 4 to 32 days.

3. From the above observations it appears that the life cycle of *Oestrus ovis* may be completed in lambs in 3½ to 4½ months, in western Texas and eastern New Mexico.

REFERENCES

[1]Hutyra, F., and Marek, J.: Special Pathology and Therapeutics of the Diseases of Domestic Animals. (2nd ed., Alexander Eger, Chicago, 1916.) ii, pp. 1108.

[2]Portchinsky, I. A.: *Oestrus ovis*, sa biologie et son rapport a l'homme, Monographie. (Russian text.) Trudy Biuro Entom., Dept. Zemled., S. Peterb., x (1913), 3, pp. 64, figs. 1-28.

[3]Idem: Abst., Rev. App. Entom., s. B. i (1913), 8.

PRACTICAL OBSTETRICS. P. Brooke Bland, M. D., Professor of Obstetrics; assisted by Thaddeus L. Montgomery, M. D., Associate in Obstetrics, Jefferson Medical College, Philadelphia, Pa. 730 pages, 495 figures and 21 colored plates. F. A. Davis Co., Philadelphia, 1932. Cloth, $8.00.

This work, written for the human medical profession, contains several chapters which should be of considerable interest to the veterinarian. It is the purpose of the reviewer to call attention only to those parts of the text which he thinks are of interest to the veterinarian.

In the chapter on anatomy, a very interesting and concise description of the cellular structures of the cortex of the ovary is given. Earlier in the description of the ovaries, it is stated that "at birth there are 100,000 primordial egg follicles." Under the heading, "The Atretic Follicle," it is said that "since only one follicle matures during each menstrual cycle, it is evident that under the most favorable circumstances only 400 or 500 primordial follicles can reach full maturity in the span of years from puberty to the menopause. The fate of the thousands of other primordial follicles is determined by a series of regressive changes called *follicular atresia*." The formation of the corpus luteum and the internal secretion of the ovary are discussed briefly from an anatomical standpoint. While pelvimetry is not considered practical by many veterinary obstetrists, an insight into its use and the importance of the pelvic axis as gained from this text might easily lead to its modified application in domestic animals.

Of especial interest is the chapter on physiology. Considerable interest in the rôle of the internal secretions in relation to sterility and normal reproduction is being manifested by the veterinarian. In this work a very concise yet adequate portrayal of the part played by the endocrine system in normal reproduction is given in easily understood English and easily interpreted charts. The biological and physical tests for pregnancy are outlined and described. Since most of the experimental work for

these tests involved the use of animals, it is only logical that the veterinary profession should make use of the literature available.

The chapter on Toxemias of Pregnancy should be of considerable interest, especially since Roderick and Harshfield recently published a bulletin entitled "Pregnancy Disease of Sheep," which is a toxemia of pregnancy.

Trichomonas vaginalis, a protozoan invader of the vagina in women, is designated by the authors as a pathogen. Recent contributions on a similar protozoan, *Trichomonas fetus*, an invader of the genital tract of cows and probably an even more severe pathogen, should arouse interest in a comparative study, especially from the standpoint of treatment.

Throughout the book preventive obstetrics is stressed. As yet, very little in the way of preventive obstetrics has been demanded of the veterinarian. Occasionally the veterinary practitioner is called upon to examine valuable animals before or after breeding and is at a loss to know what the examination should entail. This text should be a great help in outlining and applying adaptable features of preventive obstetrics in veterinary practice whenever such service is demanded.

The book is a systematically arranged, readily understandable, illustrated text and a desirable addition to the library of any one interested in comparative reproduction in all its phases; incorporating the most recent views on endocrinology in relation to pregnancy and parturition and especially stressing preventive obstetrics. The section of referred reading is an organized guide, that provides ready access to all modern literature bearing upon obstetrics and is especially recommended to any one desiring additional information on any particular aspect of obstetrics contained in the book.

M. A. E.

La Peste Bovine. (Rinderpest.) G. Curasson, Veterinary Inspector General of Colonies. Preface by Professor H. Vallée. Vigot Fréres, Paris, 1933.

This country is fortunate at the present time in that certain animal scourges do not prevail here. Foot-and-mouth disease has been introduced to our land on several occasions but has been successfully eradicated. Rinderpest is one of the worst animal plagues of cattle in certain parts of Asia and Africa. Veterinarians from this country without foreign service are largely uninformed in respect to this disease. Dr. Curasson has had a great deal of experience with all phases of this animal infection.

He is well fitted to write this excellent monograph. I desire in particular to call attention to the excellent review of the work done in respect to preventive and curative treatment. Nearly one-half the book is devoted to this phase.

It is unfortunate that this monograph is not available in English. It would serve as a source of useful information for the veterinary profession and others interested in animal diseases in this country. Those who can read French would do well to peruse it. There is an excellent bibliography attached.

C. P. F.

PUBLICATIONS RECEIVED

Studies on the Nature of the Negri Body. W. P. Covell and W. B. C. Danks. Reprint from *Amer. Jour. Path.*, viii (1932), 5, pp. 557-571. Illus.

A Natural Infection of the Sharp-tailed Grouse and the Ruffed Grouse by *Pasteurella Tularensis*. R. G. Green and J. E. Shillinger. Reprint from *Proc. Soc. Exp. Biol & Med.*, xxx (1932), pp. 284-287.

Contagious Abortion (Bang's Disease), the Need for Further Research. H. R. Seddon. (United Pure-bred Dairy Cattle Breeders' Asso. of New South Wales, in conjunction with Dept. of Agr., New South Wales. Sydney, Australia, 1932. pp. 10.)

The Etiology of Fowl Paralysis (A Review of Literature). Jacob Biely and V. Elvira Palmer. Reprint from *Vet. Rec.*, xii (1932), 44. pp. 20.

Comparison of Conformation, Anatomy, and Skeletal Structure of the Cow and Bull of a Dairy Breed. W. W. Swett, R. R. Graves, and Fred W. Miller. Reprint from *Jour. Agr. Res.*, xlv (1932), 11, pp. 641-674. Illus.

Contagious Abortion (Bang's Disease). W. L. Hindmarsh. (United Pure-bred Dairy Cattle Breeders' Asso. of New South Wales, in conjunction with Dept. of Agr., New South Wales. Sydney, Australia. 1932. pp. 12.)

Study of the Growth and Antirachitic Factors in a Canned Food for Dogs. Laurenz Harris and Elton R. Darling. (Chappel Bros., Inc., Rockford, Ill., 1933. pp. 8. Illus.)

Microscopic Diagnosis of Parasitism in Domestic Animals. (Circ. 401, Univ. of Ill., Coll. of Agr. and Agr. Exp. Sta., Urbana, Ill., 1933. pp. 67. Illus.)

Pennsylvania Bulletin, University of. School of Veterinary Medicine, Announcement, 1933-1934. (Philadelphia, Pa., 1933. pp. 65.)

Stazione Sperimentale Zoöprofilattica della Sicilia (Zoöprophylactic Experiment Station of Sicily). (Palermo, Sicily, 1932. pp. 175. Illus.)

Brooklyn College. Inauguration of Dr. William A. Boylan as First President, and First Commencement Exercises, Class of 1932. (Brooklyn, N. Y., 1932. pp. 63.)

Union of South Africa, Eighteenth Report of the Director of Veterinary Services and Animal Industry, Onderstepoort, Pretoria. P. J. du Toit, Director. (Pretoria, South Africa, 1932. pp. 1-523, 525-1094. Illus.)

THE HEPATIC LESIONS ASSOCIATED WITH ECLAMPSIA AND THOSE CAUSED BY RAISING THE INTRA-ABDOMINAL PRESSURE. G. W. Theobald. Jour. Path. & Bact., xxxv (1932), 6, p. 843.

Severe degeneration and necrotic changes in the livers of dogs, sometimes associated with hemorrhagic necrosis in the periphery of the lobules, may be caused by frequently raising the intra-abdominal pressure to between 80 and 100 cc of saline solution for 30 seconds or longer. It is probable that the hepatic lesions associated with eclampsia and the coincident hemorrhages in the other organs of the body are more often caused by the convulsions which may be initiated by the onset of labor, than these lesions are the cause of the convulsions. It is possible to account for the degenerative changes in the liver associated with *hyperemesis gravidum* in a similar manner. The damage to the liver caused during the second stage of obstructed labor and possibly in many cases of normal labor is probably an important factor in lowering the resistance of the body to puerperal infection.

EQUINE ENCEPHALOMYELITIS. Beatrice F. Howitt. Jour. Inf. Dis., li (1932), 3, p. 493.

The virus of equine encephalomyelitis may be recovered during the febrile period from both the cardiac blood and the peripheral circulation of experimentally infected animals, including the horse. The virus has been recovered from various parts of the central nervous system of different animals, and during the febrile period has been found in the liver, spleen, kidneys, adrenal glands and salivary glands of guinea pigs. The disease can be transmitted by inoculation into the brain, the anterior chamber of the eye, the peritoneum or the veins; also when given intracutaneously or subcutaneously or by intranasal instillation. Hyperimmune serum given intramuscularly will protect a guinea pig against an intracerebral injection of the virus of equine encephalomyelitis, through the fourth hour, but not after the tenth hour, while it also is of therapeutic value when the

virus is given by the nasal route. Such serum is of value when used as a prophylactic, since it protects guinea pigs against intracerebral or intranasal inoculations if given from 24 hours to three or four days before the virus.

DOES YEAST AFFECT THE GROWTH AND INFECTIVITY OF THE NEMATODE, ASCARIDIA LINEATA, IN CHICKENS? T. D. Beach and J. E. Ackert. Jour. Parasitol., xix (1932), 2, p. 121.

Two controlled experiments involving 262 chickens were conducted to ascertain if yeast was a factor in the infectivity and growth of *Ascaridia lineata* when the host chickens were fed different forms of yeast (baker's, brewer's, and dried baker's), in addition to an adequate diet. Birds were parasitized with 50 embryonated eggs of *A. lineata* after being on the special rations a short time. The criterion used for ascertaining the degree of infectivity was the number of worms recovered at autopsy; that for judging growth of worms was their length. The authors conclude from their experiments that yeast does not contain a special growth factor for *A. lineata* when used in the presence of an adequate diet; nor does it, under the same conditions, constantly alter the infectivity of this nematode.

SOME CROSS-TRANSMISSION EXPERIMENTS WITH GONGYLONEMA OF RUMINANT ORIGIN. John T. Lucker. Jour. Parasitol, xix (1932), 2, p. 134.

Gongylonema of ruminant origin has been transmitted to two pigs. A large proportion of the larvae fed developed to maturity in pigs. The Gongylonema recovered from the experiment pigs was morphologically indistinguishable from *Gongylonema ransomi*, and the experiment is regarded as affording more conclusive proof than has been offered heretofore that this species is identical with *G. scutatum*. Administration of infective larvae of Gongylonema of ruminant origin to two dogs, two chicks and a white mouse did not produce infestations with Gongylonema in these animals. The ruminant Gongylonema has been transmitted to white rats, guinea pigs and rabbits.

THE RESPONSE OF THE ISOLATED INTESTINE TO COCAINE AND NOVOCAINE AT DIFFERENT PH LEVELS. William Salant and William M. Parkins. Jour. Phar. & Exp. Therap., xlvi (1932), 2, p. 435.

In the intestine of cats cocaine produced depression mainly when the pH of Locke solution was 7.7 and 7.8. When the pH

was increased up to 8.5, stimulation predominated, but occasionally this was followed by inhibition. Cocaine, in the same concentrations as were used for the cat intestine, caused depression in the rabbit intestine when the pH of the Locke solution was around 7.7. Stimulation occurred very rarely and was followed by depression. Depression likewise occurred when the pH was reduced to 6.5 but it was less than at the higher pH level as indicated above. In the rat intestine cocaine solutions of medium strength, the pH of Locke solution being about 7.7 or 7.8, produced increased motility which was less when the pH was about 6.5.

THE EFFECTS OBSERVED FOLLOWING THE INTRAVENOUS AND SUBCUTANEOUS ADMINISTRATION OF FLUID. J. Roscoe Miller and Charles A. Poindexter. Jour. Lab. & Clin. Med., xviii (1932), 3, p. 287.

Large amounts of fluid (0.9 per cent sodium chlorid) were given to normal and pathologic animals and no demonstrable harmful effects were seen. The amount of fluid given was proportionately far in excess of that amount usually given patients, and the time of administration was much more rapid than that usually employed. There was no persistent change in the urinary output. The speed of injection seemed to cause no difficulty. The blood volumes, as determined by the Dye method, showed no increase after the intravenous injection of large amounts of fluid. This does not agree with the amount indicated by the dilution of the blood, as shown by repeated determinations of the erythrocytes, hemoglobin, serum proteins and plasma increase. No index was found which might be used as a warning against overhydration of tissue.

CARRIERS OF INFECTIOUS BRONCHITIS. A. Komarov and F. R. Beaudette. Poultry Sci., xi (1932), 6, p. 335.

The authors have made an attempt to determine the distribution of the virus in the body of birds affected with or dead of infectious bronchitis. The liver, spleen, kidney, ovary and peripheral blood were taken during the incubation period, at the height of the disease, and from dead birds, but in no case was the virus found. The virus could always be demonstrated in the trachea of infected birds. The examination of recent and old recovered birds revealed the fact that certain ones continue to carry the virus in the upper respiratory tract. It is thought that some of the recovered birds may serve as reservoirs of in-

fection, and cause a fresh outbreak in the oncoming susceptible population. Transmission experiments by contact with such birds are being carried on.

PASTEURIZATION OF MILK ARTIFICALLY INFECTED WITH TWO STRAINS OF BRUCELLA SUIS. S. E. Park, Robert Graham, M. J. Prucha and J. M. Brannon. Jour. Bact., xxiv (1932), 6, p. 461.

Two strains of *Brucella suis,* in hermetically sealed glass tubes of whole milk (500,000,000 organisms per cc); were non-viable after 20 minutes at 140° F., after 15 minutes at 142° F., and after 7 minutes at 144° F. The same strains proved more resistant to heat in cotton-stoppered tubes of milk. *Br. suis* survived for 30 minutes at 144° F. in milk containing 10,000,000 to 500,000,000 organisms per cc, but the same period of time at the same temperature destroyed *Br. suis* in milk containing 5,000 to 1,000,000 organisms per cc. It appears that the thermal death time is influenced by the degree of contamination.

A HISTOCHEMICAL STUDY BY MICROINCINERATION OF THE INCLUSION-BODY OF FOWL-POX. W. B. C. Danks. Amer. Jour. Path., viii (1932), 6, p. 711.

Following incineration at high temperatures, the fowl-pox inclusion-body leaves a grayish white residue consisting of minute particles of mineral ash. The location of this residue corresponds topographically to that part of the inclusion-body which stains pink with erythrosin-azure. The minute particles of mineral ash correspond in relative size and location to the "Borrel bodies" and are the inorganic residue of these structures. There is evidence that these bodies, having, as they do, a relatively large amount of inorganic material in them, might well serve as a locus for absorption of virus.

A NATURAL INFECTION OF THE SHARP-TAILED GROUSE AND THE RUFFED GROUSE BY PASTEURELLA TULARENSIS. R. G. Green and J. E. Shillinger. Proc. Soc. Exp. Biol. & Med., xxx (1932), 3, p. 284.

The isolation of *Pasteurella tularensis* from a sharp-tailed grouse and from a ruffed grouse in Minnesota is reported. Identification of the organism was established by typical lesions of the disease produced, by its growth only on a medium containing cystine, by morphological characters, and by the agglutination tests which showed a prozone for the organisms isolated from

both birds. The recognition of natural infections of tularemia in quail, sage hens, sharp-tailed grouse and ruffed grouse indicates that the disease is widely distributed among species of game birds.

THE PROPAGATION OF THE ROUS SARCOMA NO. 1 IN DUCKLINGS. W. J. Purdy. Brit. Jour. Exp. Path., xiii (1932), 6, p. 473.

The Rous sarcoma No. 1 was propagated in ducklings for five tumor generations and, presumably, could be propagated indefinitely in these birds. Very young ducklings were used. They were of the Khaki Campbell variety. For the propagation of tumors it was found necessary to use minced tumor tissue as the inoculum. The dose was 0.5 cc given intramuscularly. Filtrates of duckling-grown Rous sarcomas do not produce tumors in ducklings; neither do filtrates of the fowl-grown Rous sarcoma. Filtrates of duckling-grown Rous sarcomas do produce tumors in fowls, and do so just as readily as filtrates of fowl-grown Rous sarcoma. Thus the Rous sarcoma No. 1 growing in ducklings is exactly like a mammalian tumor growing in a mammal; within the species, it is propagable by means of cell grafts but filtrates do not produce tumors. Minced tissue prepared from fowl-grown specimens of Begg's endothelioma will give rise to growing tumors in very young ducklings but the tumors are never large and they soon disappear. Filtered extracts of the fowl-grown endothelioma never produce tumors in ducklings.

THE PROPAGATION OF THE FUJINAMI FOWL MYXOSARCOMA IN ADULT DUCKS. W. J. Purdy. Brit. Jour. Exp. Path., xiii (1932), 6, p. 467.

Fujinami and Hatano found that a certain myxosarcoma of the fowl is propagable in ducks. Gye was able to confirm the observation in ducks of the Khaki Campbell variety, but only by using very young ducklings. It is now found that, by the use of doses of tissue much larger than those given by Gye, it is possible to propagate the Fujinami myxosarcoma in adult ducks of the Khaki Campbell variety through an indefinite number of generations. The greater efficacy of a large dose of the tumor mince is not due to any greater energy of growth conferred upon the cells of the resulting tumor. It is due to the fact that the resulting tumor starts in a greater number of primary foci and reaches a correspondingly greater size before retrogressive changes have time to appear.

EXPERIMENTAL PATHOLOGY OF THE LIVER. X. Restoration of the liver of the domestic fowl. George M. Higgins, Frank C. Mann, and James T. Priestly. Arch. Path., xiv (1932), 4, p. 491.

The volume of blood which is delivered to any hepatic remnant after partial hepatectomy in the fowl (as well as the dog and cat) determines largely the extent of its restoration. In the cockerel, the degree of restoration after removal of the left lobe only was far less in proportion to that which occurs in the mammal, and it is the opinion of the authors that a considerable quantity of the blood that drains the gastrointestinal tract passed through the anastomosis between the inferior mesenteric vein and the iliac veins to the posterior vena cava when the systemic blood from the legs and back was delivered to the portal vein by ligation of the posterior vena cava. The size of the remaining right lobe, after removal of the left, was greater in four months than the normal liver on which operation had not been performed.

HEMATOPOIETIC EFFECT OF NUCLEAR EXTRACTIVES OBTAINED FROM RED BLOOD CELLS OF THE FOWL. B. I. Phillips, S. J. Newsom, N. W. Jones and Oloff Larsell. Arch. Path., xiv (1932), 4, p. 498.

The hematopoietic response in a series of 5 pigs with severe anemia, produced by periodic bleedings and controlled by a standard diet, to the daily oral administration of 10 grams of nuclear extractives from the nucleated red blood cells of the fowl has been studied eight times by the authors. The response to the feeding of these extractives consists of a sharp rise in the percentage of reticulated red blood cells, an increase in the red blood cell count and a corresponding increase in the percentage and volume of hemoglobin content. The authors conclude that this hematopoietic stimulant is common to the nuclei of many tissue cells.

OCHRONOSIS IN CATTLE. H. Fink and W. Hoerburger. Abst. Arch. Path., xiv (1932), 4, p. 563.

A case of ochronosis (osteo-hemochromatosis) in a cow is described. The bones were mahogany brown and showed in filtered ultraviolet rays the characteristic bright red porphyrin fluorescence. The myeloid and fat marrow did not show fluorescence. The chemistry of the condition is discussed. The iron content of the bones was within normal limits.

MASTITIS. II. The use of certain dyes in the treatment of mastitis. G. J. Hucker and Dorothy A. Lee. N. Y. State Agr. Exp. Sta. Tech. Bul. 205 (Nov. 1932).

Three methods of treatment, by intravenous and intramammary injections and by oral administration, with certain dyes were employed to determine the curative value of brilliant green, crystal violet and two compounds known commercially as acriflavine and azamine, in acute and latent mastitis.

Oral administration of crystal violet and acriflavine failed to show any appreciable effect on the number of organisms, the cell count, or the H-ion concentration. The ingestion of azamine, however, showed a much better result. A cow was given 160 grains of azamine in the feed daily, the amount later being raised to 800 grains per day. The streptococci began to disappear at the end of the third day and did not reappear as long as the feeding continued. Similar results were obtained in a second cow, but were followed by a "flare-up" on freshening. In four other instances, results were negative.

A cow with a history of subclinical (latent) mastitis was injected intravenously with 200 cc of a 0.5 per cent solution of azamine. There was no apparent systemic reaction and no effect upon the flora of the udder could be demonstrated. A second cow was treated with a supersaturated solution of the same dye, with similarly negative results.

Inflation of the udder with bactericidal substances has been somewhat discredited by veterinarians, due partly to the lack of a material of adequate bactericidal power which would also be non-toxic to the udder tissues. In these experiments, however, azamine in a solution of 0.12 per cent sodium chlorid and 3.5 per cent lactose appeared to be highly bactericidal and to have no toxic effect on the tissues. The udder of a cow with subclinical mastitis was inflated with 250 cc of a 0.5 per cent solution of azamine, and emptied after six hours. The effect on the bacterial flora was striking. The total count was reduced materially, and the streptococci practically eliminated. A similar experiment with another cow gave equally satisfactory results.

In field tests, which were made on a number of cases of clinical and subclinical mastitis, approximately 74 per cent (68 cases) were considered definitely improved by intramammary injections of azamine. Due to the non-toxic effects upon the udder tissues and the promising results obtained from intramammary injections with this substance, it was concluded that a further study of the efficacy of azamine irrigations in the treatment of mastitis was well warranted.

Regular Army

No changes during the month of March.

Veterinary Reserve Corps

New Acceptances

Bader, Madero Norman..2nd Lt...Box 771, Wharton, Tex.
Goodman, Richard Allen 2nd Lt...3713 E. 28th St., Bryan, Tex.
Harlan, Wm. Henry.....2nd Lt...2941 Hill St., Walnut Park, Calif.
Starnes, Mervyn Benson 2nd Lt...% City Hall Annex, Dallas, Tex.

Promotions

	To	
Burke, John Warden....	Capt.....	Div. of Health, U. B. Annex, Dayton, Ohio.
Crawford, Frank Wright.	Capt.....	108- 12th Ave., No., South St. Paul, Minn.
Miller, Fred Henry.....		East Side Market Sq., Wausau, Wis.

Transferred from Cavalry-Reserve to Veterinary-Reserve

Smith, Connor Dart....2nd Lt...Box 391. Standish, Mich.

Financing the Chicago World's Fair

"Pay as you go" has been the motto of the Century of Progress Exposition at Chicago. No subsidy was asked, from either national, state or city government. The buildings were not erected until the money was in hand to pay for them. The original funds were raised through a $10,000,000 bond issue subscribed by private citizens. Other pre-fair income has been received from sales of exhibit space and concessions.

Increased Use of Horses Indicated

That the horse is staging a "come-back" in the West is indicated by the fact that a wholesale hardware dealer in San Francisco recently ordered a carload of whippletrees—the first in fifteen years. It was reported also that the horseshoe business is picking up right along.

A Veterinarian as Secretary of State

It will be gratifying to veterinarians to know that a member of the profession was elected to a high office in the state of Washington at the 1932 general election. Dr. Ernest N. Hutchinson, running on the Democratic ticket, was elected Secretary of State.

Dr. Hutchinson was graduated from the Chicago Veterinary College in 1894 and was appointed an assistant inspector in the U. S. Bureau of Animal Industry, August 15, 1896. The following year he was placed in charge of the B. A. I. station at Portland, Ore. On May 1, 1900, he was promoted with the rank of inspector-in-charge and placed in charge of the stations at Tacoma and Seattle, Washington, in addition to Portland. During the summer of 1903, Dr. Hutchinson was transferred to Salt Lake City, Utah, to conduct work on the eradication of sheep scabies. He was transferred to the field station at Pendleton, Ore., early in 1907, and, on July 1, 1909, was made inspector-in-charge at Portland. After several assignments to inspection work along the Canadian border, over a period of about ten years, Dr. Hutchinson left the service (June 30, 1921), to become identified with the dairy interests of the state of Washington. For a number of years, Dr. Hutchinson was a field representative of the Washington Dairy Products Marketing Bureau, which position he held at the time of his election to the office of Secretary of State.

A piece of campaign literature, put out in behalf of Dr. Hutchinson's candidacy, was entitled, "A Recipe with a Punch." Here it is: "Mix a little horse sense with your politics. Take a pinch of caution against unfulfillable promises. Add a vote for Dr. Ernest N. Hutchinson for Secretary of State. And stir up things in that office so that, for the first time in years, it will do the work for which it was intended." Further, we read: "Ask anyone in Washington's gigantic dairy industry what he thinks of Dr. Hutchinson's ability." Besides claiming to have been a Democrat for 40 years, Dr. Hutchinson advocates temperance, believes in state liquor control, but says, "A glass of milk is better than any of them."

Insects to Elephants

A new, 36-page, illustrated catalog, "Supplies to Mount Insects to Elephants," has been issued by M. J. Hofmann, 989 Gates Ave., Brooklyn, N. Y. It lists supplies for taxidermists, museums and zoölogists, and covers about everything from glass eyes to ostrich eggs. A free copy will be sent to veterinarians on request.

Why Not Celebrate?

The Chicago Veterinary College was organized in 1883. Why would it not be a good idea for the graduates of this institution to get together during the Chicago convention of the A. V. M. A. in August and celebrate the fiftieth anniversary of the establishment of the first private veterinary college in the United States west of New York City?

Michigan Golden Anniversary

The fiftieth anniversary of the organization of the Michigan State Veterinary Medical Association will be celebrated at Michigan State College, East Lansing, June 27-28. It is claimed that the Michigan organization is the oldest state association in the country, having been formed at Detroit, July 23, 1883. Two of the charter members are still alive, Dr. Joseph Hawkins (Ont. '71), of Harbor City, Calif., and Dr. J. C. Whitney (Ont. '83), of Hillsdale, Mich.

Corn States in Larger Quarters

The Indianapolis offices of the Corn States Serum Company were moved from 137 West Market Street to 1026 North Illinois Street, on April 1. Three floors are occupied at the new location, where a complete new system of refrigeration has been installed.

Anti-Cropping Laws

Four states have laws forbidding the cropping of dogs' ears: Connecticut, Massachusetts, New Jersey and New York. In Michigan the operation may be performed legally only by a licensed veterinarian. An anti-cropping law has been introduced in the Pennsylvania legislature.

CORNELL CONFERENCE FOR VETERINARIANS

The twenty-fifth annual Conference for Veterinarians was held at the New York State Veterinary College, Cornell University, January 12-13, 1933. Dr. D. H. Udall presided at the opening session. He first introduced Dr. W. A. Hagan, new Dean of the New York State Veterinary College.

Dr. Hagan extended the welcome of the college to the members of the conference. He spoke of the history of the conference. He pointed out that new things are not always new. The use of brom-thymol was taken as an illustration. This dye was used many years ago, at the Geneva Station, by Breed and Brew. After a lapse of fifteen years, Dr. Udall demonstrated its value in the diagnosis of mastitis. He spoke of swine erysipelas, which had been diagnosed recently in New York, by Dr. D. W. Baker. He emphasized the importance of keeping up by reading and said that one of the functions of the conference was to report on recent advances and discoveries to veterinarians who did not have the time or facilities for keeping posted on all of these things. Intelligent reading is a virtue to be cultivated in the veterinary profession. The help of the faculty was proffered to those who had problems to solve.

Dr. Udall next introduced Dr. Jesse Sampson, who presented a paper, "The Alkali Reserve of the Blood of Animals in Health and Disease," which had been prepared jointly by Dr. Sampson and Dr. C. E. Hayden. The speaker gave first place to sodium bicarbonate in the maintenance of the alkaline reserve and spoke of the carbon dioxid content of the blood as a measure of the reserve. The talk was illustrated by slides which carried tabulations of the carbon dioxid content of the normal blood of the horse and cow. Other slides gave the carbon dioxid findings in the blood of normal pregnant cows, cows in milk fever, pneumonia and other pathological conditions. A distinction between acidosis and alkalosis was drawn and reference made to the importance of an adequate alkaline reserve in the normal animal and the condition which might indicate a lowered reserve. The

therapy of sodium bicarbonate was emphasized because of its great importance in overcoming and preventing a lowered reserve.

This conference was notable for the considerable number of papers and addresses furnished by leaders in different fields of work who came to us from other sections. Dr. J. Howard Brown, Professor of Bacteriology, Johns Hopkins Medical School, Baltimore, Maryland, presented an instructive and interesting paper, "The Streptococci of Milk, with Special Reference to Human Health." The speaker reviewed the types of streptococci to be found in milk. Epidemics of septic sore throat were attributed to organisms which had gained access to the udder as from human carriers. Scarlet fever was taken up in much the same way. Mastitis milk, the speaker said, was not the cause of these things, yet mastitis milk was to be avoided.

Dr. H. E. Moskey, of the Food and Drug Administration, Washington, D. C., favored the conference with a paper, "Misbranded Live Stock and Poultry Remedies." This paper was an index of the great extent of the laborious work done by the Administration in order to protect the stockman, poultryman and veterinarian against the devices of the unscrupulous or mistaken producer of such remedies.

Drs. H. H. Dukes and Jesse Sampson, of the Department of Veterinary Physiology at Cornell University, did some very interesting work in "A Physiological-Pharmacological Demonstration of the Circulation." The experiment animal was a dog; the drugs included atropin, adrenalin, arecolin and nitroglycerin. The effect of these drugs was recorded on a kymograph. The graphic records of blood-pressure changes, circulation rate, and changes in respiration were very illuminating to the conference.

Dr. H. H. Dukes has recently come to Cornell from Ames, Iowa, to take up the work in physiology of the late Dr. P. A. Fish. The demonstration by Dr. Dukes introduced him to New York practitioners and was received with great enthusiasm.

Dr. C. E. Hayden presided during the course of the afternoon session of the first day. Dr. H. J. Milks presented the first paper of this session. The title was "Uses of Some Drugs Acting on the Circulatory System." This practical paper by Dr. Milks was in close coördination with the demonstration of the morning session. The two furnished good evidence of the support which experimental laboratory work can and does lend to the clinician.

Dr. J. A. Campbell, Toronto, Canada, spoke on "Canine Dystocia and Its Treatment." The usual avid interest which at-

tends any talk or demonstration given by Dr. Campbell was evident. The talk brought out a great deal of helpful discussion.

Dr. Crittenden Ross, Veterinary Inspector, Department of Health, New York City, read the next paper, for which he had chosen the subject, "Some Beneficial Results of Mastitis Research as Seen from Health and Economic Viewpoints." Dr. Ross stressed the helpful results coming as a result of mastitis research. He emphasized the part in mastitis control taken by practitioners attending previous conferences and keeping informed through the literature of research. These men, he said, are proving best fitted to help spread the beneficial results of such research.

"Diseases Affecting Wild Life" was illustrated and profitably presented by Dr. J. E. Shillinger, of the Biological Survey, Washington, D. C.

Dr. J. N. Frost gave the last paper of the session. His subject was "Diseases of the Foal at Weaning Time." Dr. Frost can always be depended on to present much helpful, practical information. In the presentation of this paper he lived up to expectations.

The evening session convened at 7:30. Dr. H. J. Milks introduced Prof. S. H. Gage. Professor Gage illustrated his address, "The Presence of Mineral Matter Shown in Microscopic Sections of Soft Tissues; and the Revelations of the Ultra Violet Light," with lantern-slides and demonstrations. Any demonstration or talk by Professor Gage is always interesting, instructive and entertaining. This contribution was no exception. The picture of the influence of the condensed and luminescent light rays in bringing about chameleon changes in color are not to be forgotten. At the hands of Professor Gage this rather highly technical subject became relatively simple. Scientist, sage, philosopher and friend; a tower of strength to veterinary education at Cornell. He inspired us by his enthusiasm and his presence. A smoker followed the demonstration.

The morning session of the second day was given over to a program of clinics and demonstrations.

Dr. J. N. Frost presided during the afternoon session of the second day. The first number was given jointly by Drs. H. L. Gilman, H. S. Cameron and C. H. Milks. The subject was "Recent Researches in Bang's Disease." Dr. Gilman spoke of the infective strains in 117 animals studied and pointed out that all but four were of bovine origin; the four were porcine. Dr. Cameron spoke of his recent work on the viability of the Bang

organism. Dr. Milks detailed the efforts to convert bovine into porcine types.

Dr. J. G. Wills, Department of Agriculture and Markets of New York State, discussed "New York State Regulations Regarding Bang's Disease." Dr. Wills has charge of this work for the department. The regulations were discussed at some length and with profit to the practitioners.

Dr. N. F. Williams, State Veterinarian of Texas and President of the A. V. M. A., held the close and careful attention of the audience as he talked on the subject "Have We Kept the Faith?" We appreciated the visit and speech of this genial and forceful representative of the A. V. M. A. Dr. Williams focused our minds on the zeal of our fore-fathers in the establishment of our great country and the high purpose of the early veterinarians in disease control and the up-building of the profession. We were urged to put "first things first" and so to keep the faith of these earlier patriots and builders of a comparatively new science.

Dr. Frost next introduced Dr. F. S. Jones, of the Rockefeller Institute for Medical Research, Princeton, N. J. Dr. Jones spoke on the subject, "Discussion of Infectious Enteritis of Cattle with Special Reference to Winter Diarrhea."

Dr. D. H. Udall was the last speaker of this session. He gave an illustrated talk, "Some Causes of Sterility." The slides depicted the pathological conditions found in the genital organs and placental membranes. These conditions, brought about by various causes, were pointed out to be the cause of much sterility in our breeding animals.

The banquet for the 25th annual conference was held on Friday evening, in the Masonic Temple, and was largely attended. Dean W. A. Hagan presided. Dr. C. H. Milks led the singing of the Cornell Alma Mater as a prelude to a fine dinner and dinner program.

Dr. Hagan gave a brief survey of the poultry disease situation in New York State. Poultry production is one of the leading industries in the State and as such, he stated, demands more attention than it has heretofore received from the veterinary profession. He stressed the point that much of the work in the control of poultry diseases must be left in the hands of the local veterinarian. It was with this thought in mind that a poultry disease school was started by the faculty at the College, he said, and it was his hope that additional members, of the men coming to the conference, would avail themselves of the instruction offered.

Mr. H. S. Manley, legal counsel to the Department of Agriculture and Markets at Albany, briefly summarized the details of the case then pending decision in the State Supreme Court, relative to the injunction obtained by Wisconsin cattle dealers restraining the Department from enforcing the contagious abortion regulations that apply to the importation of cattle into New York State.

Professor F. B. Morrison, of the Department of Animal Husbandry at Cornell University, outlined the plan to be sponsored by the College of Agriculture for "home made" farm relief. Significant features of this program, according to Professor Morrison, included recommendations for (1) more utilization of home-grown feeds, (2) increased production of legumes and (3) greater consumption of dairy products by New York farmers and the members of their families.

The main speaker of the evening was Professor E. F. Phillips, of Cornell University. In an address that was thoroughly enjoyed, Prof. Phillips described the bright and the dark side to the life of the average soviet citizen as he is living it today in Communist Russia.

Group singing of the "Evening Song," led by Dr. C. H. Milks, was the concluding number and brought to a close the 25th consecutive annual conference, the first of which was initiated by Dr. V. A. Moore, the dean of the College, and held in Ithaca, in January of 1909.

The conference was highly successful; the attendance was large, beyond any expectations. For several years it has been said that the conference of that year was the best of them all. The report of the conference just closed must be that it was the best of them all. The careful planning, the valuable papers presented by visitors and faculty, the unusual clinics and demonstrations, are a tribute to the administration of the new dean, Dr. W. A. Hagan. Under his guidance the conference will continue an increasingly helpful force to the veterinary profession.

C. E. HAYDEN,
JESSE SAMPSON, *Reporters.*

PHILIPPINE VETERINARY MEDICAL ASSOCIATION

The fifteenth annual meeting of the Philippine Veterinary Medical Association was held at the Philippine Columbian Club, Manila, P. I., February 10-11, 1933. About fifty veterinarians, including private practitioners, Army veterinarians, veterinari-

ans of the Bureau of Animal Industry, and members of the faculty of the College of Veterinary Science, University of the Philippines, besides one animal husbandman and several senior students, attended the convention.

The first day opened with a message from His Excellency, Governor General Theodore Roosevelt. This was followed by the annual address of the President, Dr. Victor Buencamino, who explained in general terms the various veterinary problems confronting the profession in the Philippines. Following this, the business session was held. In the afternoon of the same day the scientific session began. Many interesting papers were presented which stimulated lively and valuable discussions. The scientific session was resumed the following morning, lasting till noon, when a banquet was held, at the "Jungletown Cafe" of the Bay View Hotel, at which Hon. Vicente Singson Encarnacion, Secretary of Agriculture and Commerce, was the guest of honor.

On the first day of the scientific session the following papers were read:

"The Army Veterinary Service," by Lieut. Col. George H. Koon, U. S. Army.

"Problems in Veterinary Parasitology in the Philippines," by Dr. Marcos Tubangui, Bureau of Science.

"An Atypical Form of Avian Pest," by Dr. Ramon Acevedo, Bureau of Animal Industry.

"The Rate of Improvement in the Breeding of Farm Animals by the Method of Mass Selection as Affected by Varying Number of Factors," by Dr. Miguel Manresa, Messrs. D. Clemente and S. R. Cruz, College of Agriculture, University of the Philippines.

"Personal Observations of a Meat Inspector," by Dr. Juan C. David, Bureau of Animal Industry.

"Small-Animal Practice in San Francisco, California," by Dr. Delphine Lumikau.

Interesting and valuable discussions followed the reading of the papers.

On the second day, the following papers were read and discussed:

"Veterinary Science in Relation to Animal Production," by Dean Gregorio San Agustin, College of Veterinary Science, University of the Philippines.

"Chemical Changes in the Blood of Surra-Infected Animals," by Maj. Raymond Randall, U. S. Army Medical Research Board.

"The Outlook of the Meat Industry in the Philippines," by Dr. Santiago Rotea, Bureau of Animal Industry.

"The Resistance of the Eggs and Larvae of *Stephanurus Dentatus* with Special Reference to the Control of Stephanuriasis," by Dr. Zacarias de Jesus, College of Veterinary Science, University of the Philippines.

"Rinderpest Control in the Field," by Dr. Segundo Alano, Bureau of Animal Industry.

"A Prophylactic Vaccine Against Hemorrhagic Septicemia," by Dr. Teodulo Topacio, Bureau of Animal Industry.

A. K. GOMEZ, *Secretary-Treasurer.*

LOUISIANA VETERINARY MEDICAL CONFERENCE

The annual veterinary conference under the auspices of the Department of Animal Pathology of the Louisiana State University was held in the Dalrymple Memorial Building, Baton Rouge, La., March 1-2, 1933.

Dr. N. F. Williams, of Fort Worth, Texas, president of the American Veterinary Medical Association; Dr. H. J. Milks, of New York State Veterinary College, Cornell University, and Dr. Ernest Carroll Faust, of Tulane School of Tropical Medicine, were the special lecturers of the conference.

Of general interest to those in attendance were the excellent lectures and demonstrations conducted by Dr. Milks. His lectures covered various phases of small-animal practice as well as pharmacology. One period was devoted entirely to diseases of the eye and skin, and the other periods were devoted to discussions of some common surgical problems and some phases of pharmacology. Dr. Milks was unusually well qualified to give this series of lectures because of his knowledge of existing conditions in Louisiana. At one time Dr. Milks was associated with Dr. Dalrymple in connection with the Agricultural Experiment Station of the Louisiana State University.

Dr. Williams, as speaker at the annual banquet, briefly outlined some problems confronting the veterinary profession at the present time. Dr. Williams' attendance was enthusiastically received by his many personal friends in Louisiana.

"The Parasitic Infections of Domestic Animals and Their Relationship to Human Disease in the Southern United States" was the title of a very interesting paper presented by Dr. Faust. Other subjects presented were "Coccidiosis in Domestic Animals," by Dr. R. L. Mayhew, of Louisiana State University, and "Cattle Diseases from the Practitioner's Viewpoint," by Dr. F. J. Douglass, of New Orleans.

One of the entertainment features was a visit to Louisiana's new State Capitol, which is situated on the old university campus. This visit was of special interest to Dr. Milks because the capitol stands on the exact spot formerly occupied by the laboratory in which he worked while connected with the University.

The conference came to a close with the annual business meeting of the Louisiana Veterinary Medical Association. The fol-

lowing were elected as officers for the ensuing year: President, Dr. W. J. Gray, Thibodaux; vice-president, Dr. C. McH. Greer, Winnsboro; secretary-treasurer, Dr. H. A. Burton, Alexandria (reëlected).

HARRY MORRIS, *Reporter.*

EAST TENNESSEE VETERINARY MEDICAL SOCIETY

A quarterly meeting of the East Tennessee Veterinary Medical Society was held March 11, 1933, at Knoxville, Tenn.

President J. F. Kagey, of Kingsport, called upon Dr. M. Jacob, of the University of Tennessee, Knoxville, to introduce Dr. S. Marcovitch, of the Tennessee Agricultural Experiment Station. Dr. Marcovitch gave a very interesting talk on "Insects and Their Control." His remarks on the different preparations used in controlling insect parasites of animals, as well as those found on vegetables, were especially appreciated. He brought out the fact that the thing that is giving research men most concern at present is the physiological effect of insecticides on man and animals. Dr. Marcovitch also presented some pictures showing the mottling effect of fluorin compounds on the teeth.

Dr. F. W. Morgan, of Chattanooga, spoke on "Controlling Internal Parasites of Dogs and Cats." He lamented the fact that intestinal lavage is not practiced by more small-animal men, and stated that he used irrigation not only for poisons but also for worms in dogs and cats.

The following were elected to serve as officers during the ensuing year: President, Dr. R. E. Bauch, Knoxville; secretary, Dr. R. E. Baker, Morristown (reëlected).

R. E. BAKER, *Secretary.*

NEW MEXICO VETERINARY MEDICAL ASSOCIATONI

The annual meeting of the New Mexico Veterinary Medical Association was held at the Franciscan Hotel, Albuquerque, March 17-18, 1933. An interesting program was presented and the attendance was good, considering the limited number of veterinarians in the State. Officers for the ensuing year were elected as follows: President, Dr. F. H. Barr, Albuquerque; vice-president, Dr. E. J. Foreman, Trinidad, Colo.; secretary-treasurer, Dr. H. E. Kemper, Albuquerque.

H. E. KEMPER, *Secretary-Treasurer.*

LINN COUNTY VETERINARY ASSOCIATION

A dinner meeting of the Linn County Veterinary Association was held at the Hotel Montrose, Cedar Rapids, Iowa, April 13, 1933. The meeting was well attended and an interesting program was carried out. Dr. R. M. Hofferd, of Cedar Rapids, discussed "Hog Cholera." Dr. F. M. Wilson, of Mechanicsville, discussed "Cesarean Section" and Dr. C. H. Waite, of Stanwood, chose "Navel Ill" as his subject. Dr. J. W. Griffith, of Cedar Rapids, spoke on "Rearing Orphan Sucklings" and Dr. John B. Bryant, of Mount Vernon, reported his observations on "Skin Afflictions of Sucklings." The subject of "Secondary Pig Anemia" was presented by Dr. A. R. Menary, of Cedar Rapids.

Officers of the Association for the current year are: President, Dr. R. M. Hofferd, Cedar Rapids; vice-president, Dr. John B. Bryant, Mount Vernon; secretary, Dr. K. Bogaard, Cedar Rapids.

L. W. KELLOGG, *Reporter.*

SOUTHERN OHIO VETERINARY ASSOCIATION

A meeting of the Southern Ohio Veterinary Association was held at the General Denver Hotel, Wilmington, Ohio, April 13, 1933. The program consisted of short talks by Dr. F. A. Zimmer, of Pataskala; Drs. D. C. Hyde, R. E. Rebrassier and A. J. DeFosset, of Columbus, and Dr. O. C. Alspach, of Marion. More than fifty veterinarians were in attendance. A banquet preceded the program. Dr. Neil H. Myers, of Wilmington, is president of the organization.

BUREAU TRANSFERS

DR. B. C. JOHNSON (U. S. C. V. S. '20) from Albert Lea, Minn., to Milwaukee, Wis., on meat inspection.

DR. R. F. KRENEK (K. C. V. C. '14) from Caldwell, Tex., to Sioux City, Iowa, on meat inspection.

DR. MELVIN A. RUCK (O. S. U. '16) from South Kortright, N. Y., to New York City, on meat inspection.

DR. N. G. COBBETT (Colo. '21), from Lamar, Colo., to Las Vegas, N. M., on field inspection.

DR. G. H. EHLERS (K. C. V. C. '12) from Scobey, Mont., to Pembina, N. Dak., on international inspection and quarantine.

DR. AUGUSTUS BERDAN (N. Y.-Amer. '03) from Pembina, N. Dak., to Saint Albans, Vt., on international inspection and quarantine.

DR. W. A. MCDONALD (K. C. V. C. '12) from Little Rock, Ark., to Baton Rouge, La., in charge of tick eradication.

DR. EDGAR HEINY (Ind. '08) from Navasota, Texas, to Casper, Wyo., on field inspection.

NECROLOGY

GEORGE R. CALDWELL

Dr. George R. Caldwell, of Augusta, Me., died at his home, February 26, 1933, after an illness of only two days.

Born in Providence, R. I., May 14, 1874, Dr. Caldwell was graduated from the Ontario Veterinary College in 1897. He engaged in general practice at Ellsworth, Me., until he entered the service of the U. S. Bureau of Animal Industry, in 1904. He had been inspector in charge of tuberculosis eradication in Maine since 1926, when he was promoted from field inspector at Portland, Me. Prior to that he was stationed in Boston.

Dr. Caldwell joined the A. V. M. A. in 1919. He was a member of the Knights Templar and president of the Federal Business Men's Association of Augusta. Surviving him are his widow, two daughters and one brother. Burial was at Ellsworth, Me.

J. R. C.

N. J. DEILING

Dr. N. J. Deiling, of Dallas Center, Iowa, died in his office, March 20, 1933, at the age of 58. He was found by his son and death was ascribed to an attack of heart disease. Dr. Deiling was a graduate of Iowa State College, class of 1908, and had practiced at Dallas Center for 25 years. He joined the A. V. M. A. in 1915 and was a member of the Committee on Local Arrangements for the Des Moines meeting in 1924.

JOSEPH STEVEN POWELL

Dr. Joseph S. Powell, of Fort Worth, Tex., died March 5, 1933, following a stroke of apoplexy. He was born at Yantley, Ala., June 12, 1894, and, after receiving common and high school education, entered the Alabama Polytechnic Institute to study veterinary medicine. He was graduated in 1914 and entered the service of the U. S. Bureau of Animal Industry in 1917. He was stationed at East Saint Louis before being transferred to Fort Worth.

Dr. Powell joined the A. V. M. A. in 1918. He was a member of the National Association of B. A. I. Veterinarians and Emeth Lodge 1030 F. & A. M. He is survived by his widow, one daughter and one son.

F. D. P.

ERNEST McNAIR

Dr. Ernest McNair, of Idaho Falls, Idaho, died suddenly, at his office, March 6, 1933, following an attack of acute indigestion.

Born at Marysville, Mo., July 28, 1857, Dr. McNair was graduated from the Chicago Veterinary College with the class of 1891. After practicing in various places in Illinois, Iowa and Missouri, Dr. McNair located at Idaho Falls in 1912 and remained there until his death. He is survived by one son and one daughter.

REUBEN GORDON

Dr. Reuben Gordon, of Bronx, N. Y., died March 22, 1933, following a thoracoplasty operation.

Born in London, England, August 12, 1897, Dr. Gordon was a graduate of De Witt Clinton High School, New York City, and studied veterinary medicine at Cornell University. He was graduated in 1925 and practiced first at Patchogue, Long Island.

Dr. Gordon joined the A. V. M. A. in 1928. He was a member of the Long Island Veterinary Medical Association and Phi Zeta Fraternity.

WILLIAM E. GROFF

Dr. William E. Groff, of Massillon, Ohio, died March 29, 1933, after an illness of several months. He was a graduate of the American Veterinary College, class of 1890, and had been located in Massillon ever since his entry into the profession. He is survived by his widow, one daughter, one sister and two brothers, one of whom is Dr. B. W. Groff (Ont. '98), of Massillon, Ohio.

ALVIN BROERMAN

Dr. Alvin Broerman, of Reynoldsburg, Ohio, died April 2, 1933, after an illness of three years.

Born at New Bremen, Ohio, July 29, 1887, Dr. Broerman attended local grade and high schools before entering Ohio State University. Following his graduation in 1909, he accepted a po-

sition in the Philippines and spent about four years in the Islands, part of the time in the Department of Agriculture and later at the University of the Philippines. In 1913 he returned to his home at New Bremen, Ohio. He then went to Cornell University for postgraduate work, returning to Ohio in 1914 as a member of the staff of the Ohio Agricultural Experiment Station. Four years ago, as a result of a reorganization affecting the Experiment Station, the State Department of Agriculture and the College of Veterinary Medicine of Ohio State University, he was transferred to the State Serum Institute at Reynoldsburg and made associate professor of veterinary medicine at the University.

Dr. Broerman joined the A. V. M. A. in 1920. He was a member of the Ohio State Veterinary Medical Association and the United States Live Stock Sanitary Association. He is survived by his widow (née Luella Fledderjohann), one son, one daughter, his parents and a sister. Interment was at New Bremen, his birthplace.

LEE F. ROSS

Dr. Lee F. Ross, of Aurora, Ind., died suddenly at his home, April 5, 1933. His death was caused by a heart attack. He apparently had been in the best of health until his fatal illness.

Born at Manchester, Ind., November 26, 1879, Dr. Ross attended local schools and the Indiana Veterinary College. He was graduated in 1911 and practiced first at Sunman, Ind. In 1915 he located in Aurora, and for some time was associated with his brother-in-law, Dr. T. J. Martin (Cin. '11). On July 20, 1917, Dr. Ross entered the service of the U. S. Bureau of Animal Industry as a veterinary inspector and was stationed at Pittsburgh, Pa., on meat inspection. He resigned on May 15, 1919, to return to private practice. He is survived by his widow (née Blanche Martin), one son, five brothers and two sisters.

Dr. Ross joined the A. V. M. A. in 1917.

ARTHUR L. BEVAN

Dr. Arthur L. Bevan, of Frankfort, Ky., died April 7, 1933. He developed a streptococcic infection of the throat which terminated in a fatal septicemia.

Born in Johnstown, Pa., November 16, 1891, Dr. Bevan received a high school education and studied veterinary medicine at the Colorado Agricultural College. He was graduated in 1911

and entered the service of the U. S. Bureau of Animal Industry the same year. He had been stationed in central Kentucky, on field work, for the past eight years.

Dr. Bevan joined the A. V. M. A. in 1924. He was a member of Alpha Psi Fraternity. He is survived by his widow (née Bonnie Barnett), his mother and two brothers.

T. P. P.

HENRY L. B. COOTE

Dr. Henry L. B. Coote, of Michigan City, Ind., died suddenly at his home, April 8, 1933, of a heart attack.

Born in England, October 23, 1860, Dr. Coote emigrated to Canada at the age of 19. He studied veterinary medicine at the Ontario Veterinary College. Following his graduation in 1893, he located for practice at Minnedosa, Manitoba. In 1900 he removed to Chicago, stayed there a year, and then located at Michigan City where he remained until his death. He was a member of the Board of Health from 1911 until 1921, when he became associated with the Clinic Hospital. In 1929 he again entered private practice. Dr. Coote was one of the best known pathologists in the county, and in 1930 he became associated with the Fairview Hospital, at La Porte, Ind., in that capacity.

Dr. Coote is survived by his widow (née Hilda Margaret Floyd) and one son.

THEODORE J. MENESTRINA

Dr. Theodore J. Menestrina, of East Saint Louis, Ill., died at his home, April 9, 1933, from injuries received when he was attacked by a bull at the National Stockyards, almost a year ago.

Born at Jirol, Austria, March 19, 1869, Dr. Menestrina came to the United States as a boy of twelve. He received a high school education and studied veterinary medicine at the Chicago Veterinary College. Following his graduation in 1897, he located in East Saint Louis. He served in Battery A of the Missouri Volunteers in the Spanish-American War and was the first Commander of the United Spanish-American War Veterans in East St. Louis.

Dr. Menestrina joined the A. V. M. A. in 1919. He was a member of the Illinois State Veterinary Medical Association. He is survived by two sons, one daughter and three sisters.

G. H. B.

CALVERT H. PLAYDON

Dr. Calvert H. Playdon, of Reading, Mass., died at his home, March 30, 1933, following a long illness.

Born in Bradford, England, February 18, 1874, he came to this country, with his parents, when seven years old. He attended the public schools of Andover, Mass., finished high school and entered Harvard University. Following his graduation in 1896, Dr. Playdon located at Reading and engaged in general practice.

For over a quarter of a century Dr. Playdon was a member of the Board of Health and served several terms as chairman. He was also Inspector of Animals for many years.

Dr. Playdon joined the A. V. M. A. in 1902. He was a member of the Massachusetts Veterinary Association and an honorary member of the Reading Rotary Club. He was also a member of several Masonic organizations. He is survived by his widow (née Alice Haley), one daughter, one son, one brother and three sisters.

Our sympathy goes out to Dr. E. G. Pigman, of Houston, Tex., in the death of his mother, Mrs. H. A. Force, of Denver, Colo., March 30, 1933, at Kearney, Neb., following an operation for infection of the ear.

PERSONALS

BIRTHS

To Dr. and Mrs. Harold D. Osborne, of Gladbrook, Iowa, a son, Harold Donald, January 25, 1933.

To Dr. and Mrs. D. M. Colby, of Brooklyn, N. Y., a daughter, Nancy Jane, February 14, 1933.

To Dr. and Mrs. H. L. Church, of Battle Creek, Neb., a son, Marlow, February 17, 1933.

To Dr. and Mrs. N. B. Moore, of Kinston, N. C., a son, Frederick Meyer, February 17, 1933.

To Dr. and Mrs. R. F. Avery, of Tama, Iowa, a son, Ralph Raymond, February 24, 1933.

To Dr. and Mrs. G. H. Leenerts, of Humphrey, Neb., a son, Thomas Anthony, March 9, 1933.

To Dr. and Mrs. C. H. Hays, of Pierre, S. Dak., a daughter, Joan Keane, March 20, 1933.

To Dr. and Mrs. L. E. Case, of Honolulu, Hawaii, a son, Donald Lloyd, March 22, 1933.

To Dr. and Mrs. R. A. Runnells, of Ames, Iowa, a daughter, Mildred Virginia, April 11, 1933.

PERSONALS

DR. A. A. WILHELM (Cin. '20), formerly of Fostoria, Ohio, has located for general practice at Bellevue, Ohio.

DR. M. L. MCLAUGHLIN (Iowa '15) has removed from Los Angeles, and is now located at Southgate, Calif.

DR. EARL R. BATES (Mich. '25), of Merrill, Mich., was a patient in Saint Luke's Hospital, Saginaw, in March.

DR. J. W. BRYANS (Ont. '07) has opened a hospital for small animals at 2156 W. Slauson Ave., Los Angeles, Calif.

DR. J. C. STOKES (Cin. '12), of Calumet City, Ill., is a candidate for president of the Board of Education of his city.

DR. G. R. DOWD (K. S. C. '25) is located at the Saranac Laboratory for the Study of Tuberculosis, Saranac Lake, N. Y.

DR. ELDON C. BARCLAY (Mich. '29), formerly of Romeo, Mich., has opened an office for general practice at Almont, Mich.

DR. Z. A. DANFORTH (O. S. U. '29) has resumed practice at Winchester, Ind., after spending a year in government service.

DR. W. L. BOGGY (Chi. '15), of Breese, Ill., has announced himself as a candidate for the office of assessor of Breese Township.

DR. A. E. BEHNKE (Chi. '92), of Milwaukee, Wis., is a member of the Board of Directors of the Milwaukee Professional Men's Club.

DR. R. A. SAWYER (Iowa '26), formerly of Brookings, S. Dak., is now located in Duluth, Minn., where he is engaged in general practice.

DR. R. N. OWEN (O. S. U. '23), of Ravenna, Ohio, has accepted an appointment in the U. S. Bureau of Animal Industry, at Detroit, Mich.

DR. J. L. KIXMILLER (Ind. '15), of the Allied Laboratories staff, who was in the Argentine the past winter, is now back in Sioux City, Iowa.

DR. DANIEL DECAMP (K. S. C. '29) has requested a change in address from Jersey City, N. J., to 124 W. Main St., Patchogue, Long Island, N. Y.

DR. C. P. QUIRIN (McK. '12), of Smithton, Ill. recently resigned the office of mayor, to accept an appointment as assistant state veterinarian.

DR. ROY J. GARMAN (K. C. V. C. '14), formerly of the Los Angeles County Live Stock Inspection Department, is now located at Grants Pass, Ore.

DR. JAMES E. MCDERMID (Ont. '03), of Ladysmith, Wis., was nominated for the office of alderman of his city at the primary election recently.

DR. HENRY O. WOODROW (Ind. '02), who has been in Terre Haute, Ind., for a number of years, has returned to Linton, Ind., and opened an office there.

DR. R. P. ARMSTRONG (O. S. U. '31) removed from Newville, Pa., to Mercersburg, Pa., March 1. He reports practice as being very good, but collections slow.

DR. JAMES MORRIS (Iowa '21), formerly engaged in tuberculosis eradication work at Missouri Valley, Iowa, has resumed general practice at Ida Grove, Iowa.

DR. W. G. PORT (K. C. V. C. '17) has entered general practice at Aurelia, Iowa. He was formerly engaged in tuberculosis eradication work at Cherokee, Iowa.

DR. EDWIN R. DIMOCK (K. C. V. C. '10), of Merrow, Conn., is a member of the State Legislature and is serving as chairman of the Senate Committee on Agriculture.

DR. RICHARD H. JURDEN (K. S. C. '33) has located at Erie, Kan. Dr. Jurden finished work for his degree at the close of the first semester of the present college year.

DR. H. T. CLARNO (Chi. '18), who has been in charge of tuberculosis eradication in Pratt County, Ill., for six years, has resumed private practice at Farmer City, Ill.

DR. R. A. OGILVIE (Chi. '18), who practiced at Black Earth, Wis., for about ten years, has purchased the practice of the late Dr. W. J. Malone (Chi. '96), at Mount Horeb, Wis.

DR. A. H. F. HARMENING (Chi. '17) of Des Plaines, Ill., addressed the March meeting of the Chicago Veterinary Medical Society on "The Silver Fox as Met in General Practice."

DR. W. R. LUKENS (U. P. '29), of Hillsboro, Ohio, was taken to the Miami Valley Hospital, at Dayton, recently, for observation. He was suffering from some form of anemia.

DR. L. C. CLARK (McK. '19), who has been engaged in tuberculosis eradication for the Illinois Department of Agriculture for several years, has resumed general practice at Rushville, Ill.

DR. ROBERT B. LEEPER (K. C. V. C. '97), of Denver, Colo., was retired from the service of the U. S. Bureau of Animal Industry, February 1, 1933, and is now living at Golden, Colo.

DR. A. T. FLETCHER (Chi. '08), of Virden, Ill., sustained a fracture of one leg and numerous other painful injuries, when a cow that he was testing threw herself and caught the veterinarian's leg beneath her.

DR. HERBERT N. HOLMES (Ont. '10), formerly of Buffalo, Ill., has been looking after the practice of Dr. H. E. Nelson (McK. '15), at Mount Sterling, Ill., while the latter has been away from home regaining his health.

DR. W. W. LICHTY (Chi. '04), of Woodstock, Ill., was elected a member of the local High School Board, at the election held April 8. Dr. Lichty polled 796 votes out of a total of about 1,200 cast, a record vote for the community.

DR. N. F. WILLIAMS (K. C. V. C. '11), of Fort Worth, Texas, made an extended visit to the ranges of South Texas, the latter part of March, to supervise the shipment of some Brahman cattle to Australia where an extensive hybrid experiment will be carried on.

DR. HERMAN BUSMAN (Ont. '95), of Indianapolis, Ind., was the principal speaker at the April meeting of the Northeastern Indiana Veterinary Medical Association, held in Fort Wayne. Dr. Busman spoke on the work of the U. S. Bureau of Animal Industry.

DR. C. J. GRIFFIN (O. S. U. '13), who has been associated with the Division of Animal Industry, Ohio State Department of Agriculture, for the past three years, has located in Mendon, Ohio, for general practice. Dr. Griffin was located at Spencerville, Ohio, from 1913 until 1924.

DR. L. H. CRISLER (Ohio '94), of Covington, Ky., recently relinquished his post as Meat and Milk Inspector for the Covington Health Department, after twenty years of service. The city commissioners abolished the office as a part of an economy program. Dr. Crisler has resumed private practice.

DR. WARD GILTNER (Corn. '06), dean of the Division of Veterinary Science at Michigan State College, has been granted a leave of absence until June 1, in order that he may be able to complete residence requirements at the University of Michigan, Ann Arbor, for the degree, doctor of philosophy.